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(पहला पुनरीक्षण)

Port and Harbour Engineering —
Glossary of Terms

(First Revision)

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Ports, Harbours and Offshore Installations Sectional Committee had been approved by the Civil Engineering Division Council.

A series of Indian Standards covering various aspects of port and harbour engineering have been published. These include a large number of terms relating to ports and harbour engineering. The extensive use of these terms has necessitated the preparation of this glossary.

This standard was first published in 1974. In this revision, following changes have been effected:

- a) New terms have been added; and
- b) Definitions of many terms used in the standard have been elaborated and modified.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

In the formulation of this standard due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

*Indian Standard***PORT AND HARBOUR ENGINEERING — GLOSSARY OF TERMS***(First Revision)***1 SCOPE**

This standard covers definitions relating to port and harbour engineering.

2 TERM AND DEFINITIONS

2.1 Accretion (also Aggradation) — The growth or increase by the gradual accumulation of additional layers water borne or airborne materials or matter.

NOTE — Natural accretion is the build up of land solely by the action of forces of nature, on a beach by deposition of water borne or airborne materials. Artificial accretion is a similar build up of land by reason of an act of man, such as accretion formed by a groin, break-water, or beach fill deposited by mechanical means.

2.2 Admiralty Tide Tables — The Tide Tables published annually by the admiralty giving daily tidal predictions for standard ports and data for predictions for each day of the year at secondary ports either in the form of harmonic constants or non-constants, such as time differences and ratio of ranges on in the Indian Ocean, UK and other ports of the world.

2.3 Advance (of a Beach) (also Progression)

- a) A continuing seaward movement of the shoreline
- b) A net seaward movement of the shoreline over a specified time.

2.4 Aggradation — *see* Accretion.

2.5 Air Chamber

A hollow watertight chamber provided in caisson in which ballast to the required amount is placed, to have the required floatation of the caisson for its operation.

2.6 Altar Course

Steps provided on the inner faces of the two longitudinal walls of a graving dock to receive the side shores for keeping the vessel in position. In modern dry docks the usefulness of the altar courses is much reduced as the vessel rests on a cradle formed by the keel and bilge blocks.

2.7 Amplitude (of a Wave) (also Wave Amplitude)

- a) The magnitude of the displacement of a wave from a mean value.

NOTE — An ocean wave has an amplitude equal to the vertical distance from still water level to wave crest. For a sinusoidal wave, amplitude is one-half the wave height.

- b) The semi range of a constituent tide.

2.8 Analogue Model

A model based on the identity of the equations describing two or more systems, and carrying out measurements on that system which appears most convenient for this purpose, interpreting the results of the measurements in terms of one or more of the other systems.

2.9 Anchor

An implement for retaining or fastening a ship by chaining it to the bed of a water course.

2.10 Anchorage

A place or location for anchoring a vessel. For every port there are some such fixed places where vessels are anchored, waiting for their turn to enter the port or sail out of the port area.

2.11 Angle of Repose

The angle between the horizontal and the plane of contact between two bodies when the upper body is just about to slide over the lower. Also known as angle of friction.

2.12 Antidunes

Bed forms that occur in trains, and are in phase and strongly interact with gravity water surface waves.

2.13 Antinode (also Loop)

The part of a standing wave where the vertical motion is greatest and the horizontal velocities are least. Antinodes are associated with clapotis, and with seiche action resulting from wave reflections.

2.14 Approach Channel

The navigational channel from deep water where vessels get sufficient draft, to the dock or harbours.

2.15 Apron

An apron is the area immediately in front of or behind a wharf shed on which cargo is lifted. It is a surface, generally paved, provided wharf surface and the transit space.

2.16 Apron Conveyor

A type of conveyor made from individual apron plates that are linked together with hinges on its underside, thus creating a continuous and looped carrying surface where materials can be placed. These are widely employed for handling both heavy and light miscellaneous packages.

2.17 Armour Stone

Armour stone is a general term used to refer to a range of natural or sometimes artificial stone applications used for wave protection of shorelines and erosion protection of stream banks from the eroding action of waves and flowing water as well as in retaining walls and slope buttressing related to construction.

2.18 Arrastre

A person/entity who/which performs portside cargo handling operations, e.g. receiving, handling, custody, security and delivery of cargo passing over piers, quays or wharves, transit sheds/warehouses and open storages within the jurisdictional area of responsibility of the authorized contractor/operator.

2.19 Artificial Harbour

An arrangement, which is so constructed to perform the functions of a port.

2.20 Artificial Nourishment

The process of replenishing a beach with material (usually sand) obtained from another location.

2.21 Astern

In or towards the hind-part of a vessel.

2.22 Atoll

A ring shape coral reef, often carrying low sand islands enclosing a lagoon.

2.23 Atoll Lagoon

The body of water enriched by coral islands and reefs.

2.24 Attenuation

- a) The process of the gradual reduction in the intensity of an oscillatory waves or a water-particle motion with respect to the depth which propagates through a material medium.
- b) The decrease of water-particle motion with increasing depth. Particle motion resulting from surface oscillatory waves attenuates rapidly with depth and practically disappears at a depth equal to a surface wave length.

2.25 Audible Signals

A signal made by a distinct sound or series of sounds used as a warning medium when lighting is practically ineffective, such as in dense fog for safe and rapid navigation in channels.

2.26 Automatic Tide Gauge

The instrument with mechanical/electrical arrangements for continuous recording of the variations of tidal heights above a fixed datum in a tidal course.

2.27 Average Draft of Vessel

Derived by adding the drafts upon arrival and upon departure of all vessels and dividing them by 2.

2.28 Awash

Situated so that the top is intermittently washed by waves or tidal faction. Condition of being exposed or just bare at any stage of the tide between high water and chart datum.

2.29 Backbeach (Backwash) (also Backshore)

That zone of the shore or beach lying between the foreshore and the coastline and acted upon by waves only during severe storms, especially when combined with exceptionally high water. It comprises the berm or berms.

2.30 Backhaul

To haul a shipment back over part of a route which it has already travelled; a marine transportation carrier's return movement of cargo, usually opposite from the direction of its primary cargo distribution.

2.31 Backrush

The seaward return of the water following the uprush of the wave. For any given tide stage the point of furthest return seaward of the backrush is known as the limit of backrush.

2.32 Backshore

See Backbeach.

2.33 Backwash

- a) Same as Backrush.
- b) The movement of water back into the sea after waves thrown by an obstruction, such as a ship, breakwater or cliff.

2.34 Balance Dock

A form of floating dock which is kept level by pumping water out of, or letting it into, the compartments of side chambers.

2.35 Ballast

Materials that is used to provide stability to a vehicle or structure as on a ship, or to limit buoyancy.

2.36 Bank

- a) The rising ground bordering a lake, river or sea; of a river or channel, designated as right or left as it would appear facing downstream.
- b) An elevation of the sea floor of large area, located on a continental shelf and over which the depth is relatively shallow but sufficient for safe surface navigation; a group of shoals.
- c) In its secondary sense, a shallow area consisting of shifting forms of silt, sand, mud and gravel, but in this case it is only used with a qualifying word, such as 'sand bank' or 'gravel bank'.

2.37 Bank, Sand (also Sandbank)

A shallow area consisting of shifting forms of sand.

2.38 Bar

A submerged or submersible area of sand, gravel, or other unconsolidated material built on the sea floor or river bed in shallow water by waves, currents, tidal flow, etc. This could either be built or naturally occurring due to accretion.

2.39 Barge

A barge is a long, narrow boat with flat-bottomed vessel traditionally used to transport goods and people through inland waterways.

2.40 Barrier Beach or Offshore Barrier or Barrier Island

A bar essentially parallel to the shore, the crest of which is above normal high water level.

2.41 Barrier Lagoon

A bay roughly parallel to the coast and separated from the open ocean by barrier islands.

2.42 Barrier Lagoon

Bodies of water that are separated from larger bodies of water by a natural barrier.

2.43 Barrier Reef

A coral reef parallel to and separated from the coast by a lagoon that is too deep for coral growth. Generally, barrier reefs follow the coasts for long distances, and are cut through at irregular intervals by channels or passes.

2.44 Basin

An area of naturally or artificially partially enclosed water in free communication with the sea. The functions of basins in many cases coincide with those of docks, so that some elasticity of nomenclature is not without justification.

2.45 Basin, Boat

A naturally or artificially enclosed basin or nearly enclosed in and harbour area for small craft.

2.46 Basin, Filling Out

A recirculation basin used for filling in and draining out water from dock basin.

2.47 Basin, Tidal

A non-enclosed basin used for speedy and unrestricted arrival and departure of vessels in an area which is subjected to tidal fluctuations.

2.48 Basin, Turning

An area provided in an impounded dock or harbour for turning and manoeuvring of the ships during berthing and deberthing. The diameter of the turning basin is kept at one and a half times to two times the length of the largest vessel calling at the port.

2.49 Basin, Wet (also Wet Dock)

Areas of impounded water within which vessels can remain afloat at a uniform level, independent of external tidal action.

2.50 Bathymetry

The measurement of depths of water in oceans, and lakes; also information derived from such measurements. Bathymetry is also the study of underwater depth of ocean floors or lake floors.

2.51 Bay

A bay is a recessed, coastal body of water that directly connects to a larger main body of water, such as an ocean, a lake, or even another bay. A large bay is usually called a gulf, sea, sound, or bight.

2.52 Baymouth

A bar extending partly or entirely across the mouth of a bay.

2.53 Bayou

A minor sluggish waterway or estuarial creek, tributary to, or connecting other streams or bodies of water. Its course is usually through low lands or swamps. Sometimes called slough. It may refer to an extremely slow-moving stream or river (often with a poorly defined shoreline).

2.54 Beach

The zone of unconsolidated material that extends landward from the low water line to the place where there is marked change in material or physiographic form, or to the line of permanent vegetation (usually the effective limit of storm waves). The seaward limit of a beach *L* — unless otherwise specified — is the mean low water line. A beach includes foreshore and backshore.

2.55 Beach Berm

A nearly horizontal shore parallel ridge formed on the beach due to the landward transport of the coarsest fraction of the beach material by the wave uprush (swash).

2.56 Beach Building

Deposition of beach materials either by natural wave action or artificial process.

2.57 Beach Cusp (also Cusp)

Beach cusps are shoreline formations made up of various grades of sediment in an arc pattern. The horns are made up of coarser material and the embayment contains finer sediment.

2.58 Beach Erosion

The carrying away of beach materials by wave action, tidal currents, littoral currents, or wind.

2.59 Beach Face

The section of the shore/beach which is wetted due to the varying tide and swash under normal conditions.

2.60 Beach Ridge

A beach ridge is a wave-swept or wave-deposited ridge running parallel to a shoreline. It is commonly composed of sand as well as sediment worked from underlying beach material.

2.61 Beach Scarp

An almost vertical slope along the beach caused by erosion by wave action. It may vary in height from a few centimetres to several metres depending on wave action and the nature and composition of the beach.

2.62 Beach, Spending

To break up and disperse heavy seas, preventing them from exerting their destructive influence upon the beach, the waves are sometimes made to run up a long sloping beach, the spending beach, their energy then being absorbed gravitationally in surges and a tumult of broken water, by movement of loose beach material and by percolation of water through the material.

2.63 Beacon

Any prominent objects or structures, natural or artificial, on a coastline or river bank, which act as an aid to navigation.

2.64 Beacon, Miscellaneous

Types of navigational aids, as distinct from buoys, luminous beacons and lighthouses, used as a means of alignment or as an indication of change of direction for navigation. May be natural objects, such as lofty isolated trees, tropical features like the edge of a cliff or the summit of a hill or prominent structures of any kind.

2.65 Beam of Vessel

The width of a vessel at the widest point, or a point alongside the ship at the midpoint of its length.

2.66 Beaufort Scale

A wind force scale classified by Admiral Beaufort in 1805 for maritime purposes. The intensity of winds is expressed in twelve numbers forming a scale, each number representing a wind strength of a designated range of velocities.

2.67 Bench

- a) A level or gently sloping erosion plane inclined seaward.
- b) A nearly horizontal area at about the level of maximum water on the sea side of a dike.

2.68 Berth

A ship's station in the water where a ship stops and stays when anchored or at a wharf or alongside a structure.

2.69 Berth-Cargo

A berth for loading and unloading of cargo to from the ship.

2.70 Berth, Container

A berth for loading and unloading of containerized cargo to and from the ship.

2.71 Berthing/Docking

Manoeuvring of a vessel from anchorage position or from a pilot station to a berth, including the process of stationing the vessel alongside the pier, quay or wharf.

2.72 Container berth

Container berth means any berth at a state dock or pier designated by the State for preferential use by vessels primarily loading or unloading shipping devices.

2.73 Berth Occupancy (also Occupancy Factor of Berth)

The duration over which a ship lies anchored at the berth for loading and unloading operations in a specified period of time. It is usually expressed as a ratio of the actual time of occupation of the berth by ships to the total period specified.

2.74 Bilge Block

Blocks provided for the purpose of affording a support to the ship's hull.

2.75 Bill of lading

A contract between a shipper and carrier listing the terms for moving freight between specified points.

2.76 Bilge Block

One of the blocks supporting the bilge of a ship at the turn of the bilge while in a dry dock or under construction.

2.77 Blocks, Keel

base for the ship's keel and in order to give ready access thereto and transferring the ship's load to the foundation in a dry dock, these blocks of hard base of hard wood, cast iron or steel and a capping of soft wood, are placed on the floor of the dry dock.

2.78 Bold Coast

A prominent land mass that rises steeply from the sea.

2.79 Bollard

It is the anchor point for mooring lines to be fixed to the quay, berth and jetty at cope level in order to secure the vessel. These also provide a means of checking vessels entering or leaving the dock. These may be of concrete, cast iron or steel of different sizes and shapes.

2.80 Bore (Tidal Bore) (also Eager)

A very rapid rise of the tide in which the advancing water presents an abrupt front of considerable height. In shallow estuaries and river sections, where the range of tide is large, the high water is propagated inward faster than the low water because of the greater depth at high water. If the high water overtakes the low water, an abrupt front is presented with the high water crest finally falling forward as the tide continues to advance.

2.81 Bow-Well Dredger

A type of bucket-ladder dredger in which the ladder and buckets protrude some distance in front of the hull so that the dredger may cut its own floatation for a twenty four hours dredging in a shallow water where neither the dredger, tug, nor spoil barges can float at low water over the area before dredging.

2.82 Box Dock

A continuous floor pontoon carrying two side walls, that is, it is the only form of modern floating dock which cannot be divided into three or more parts for the purpose of self docking. It is of the simplest form and earliest type used mainly for small docks for dealing with relatively light craft, tugs, trawlers, coasting vessels, patrol and escort vessels and destroyers.

2.83 Breakbulk

Cargo that is handled in units, packages, crates, bags and the like.

2.84 Breaker

A heavy sea wave that breaks into white foam on the shore. Breakers may be classified into four types:

- a) Spilling — Bubbles and turbulent water spill down front face of wave. The upper 25 percent of the front face may become vertical before breaking. Breaking generally across over quite a distance.
- b) Plunging — Crest curls over air pocket; breaking is usually with a crash. Smooth splash up usually follows.
- c) Collapsing — Breaking occurs over lower half of wave. Minimal air pocket and usually no splash up. Bubbles and foam present.
- d) Surging — Wave peaks up, but bottom rushes forward from under wave, and wave slides up beach face with little or no bubble production. Water surface remains almost plane except where ripples may be produced on the beach face during runback.

2.85 Breaker Depth (also Breaking Depth)

The still water depth at the point where a wave breaks.

2.86 Breaker Line

The line along which waves break down in front of an obstruction or a shoaling beach.

2.87 Breaking Wave

See Breaker.

2.88 Breakwater

A structure protecting a shore area, harbour, anchorage or basin from wave disturbance.

2.89 Breakwater, Composite

A breakwater constructed by combination of a rubble — mound base and vertical wall or other form of superstructure. It is adopted at a location where the depth of water is great or there is a wide tidal range so that the quantity of rubble stone required to construct a mound breakwater of the full height would be too large and uneconomical. Of these, there is wide variety of types.

2.90 Breakwater, Floating (also Bombardon)

A removable breakwater constructed by caissons or pontoons with valves for trimming whilst afloat and for sinking when in position and pump connections for refloating, moored to the sea bed.

2.91 Breakwater, Mound (also Rubble Mound Breakwater)

A breakwater constructed by a heterogeneous

assemblage of natural rubble or undressed stone, in pieces of varying size, supplemented in many cases by artificial blocks of bulk larger than can be conveniently quarried in the natural state, the whole being deposited pell-mell without any regard to bond or bedding. The material may, however, be graded as to sizes.

2.92 Breakwater, Pneumatic

A pipeline specially designed as to arrangement of air holes, flexible couplings, floats, and means of controlling the level, to introduce a continuous stream of air under pressure for dispersion of waves in the undulatory stage, located at least 9 m under water surface to provide sufficient air lift. These are used in anchorages, temporary protection for harbour construction, lifeboat sites, control of erosion and silting, protection for stationary lightships, salvage work and so on.

2.93 Breakwater, Vertical Wall

A breakwater formed by the construction in a regular and systematic manner of a vertical wall of steel sheet piles either as single unit or as cellular construction, concrete blocks or mass concrete, with vertical or nearly vertical harbour and seaward faces.

2.94 Bridge, Bascule

A bridge, usually in two leaves, meeting at the centre of the span, revolving round a horizontal axis and provided with a counterpoise in the form of a weighted prolongation of the bridge, whereby the power required for working the bridge is reduced to the minimum. The rolling variety has got the tail-end in the form of a circular segment upon which the bridge rolls in a manner similar to the action of a rocking chair.

2.95 Bridge, Swing

Constitutes a very numerous bridge for dock work. This includes all movable movement of rotation is horizontal. This may be 'centre bearing' type in which the bridge turns upon a centre pivot or which the bridge turns entirely upon rollers.

2.96 Bridge, Traversing

Bridges of this type are supported by the quay at or about the coping level and are projected forward or withdrawn in a straightline in other their motion is rectilinear and words, approximately horizontal, or with just sufficient inclination to enable them to clear the edge of the roadway abutting on their recesses.

2.97 Bucket Ladder Dredger

An endless chain connecting a series of buckets which traverse in succession on inclined orbit, approximately elliptical, about two pivots or tumblers, excavating material at the lower tumbler and discharging it into a chute while passing over the upper tumbler. Bucket dredgers of this type have either one or two ladders (the central ladder type and the side ladder type respectively), that is, the frame, with its roller bearings, on which the buckets travel. This dredger is especially suitable for steady continuous work in hard material and in very stiff clay.

2.98 Bucket Ladder Dredger

A stationary dredger that is equipped with a continuous chain of buckets, which are carried through a structure, the ladder.

2.99 Bulk Cargo

A shipping term for items that are shipped loosely and unpackaged as opposed to being shipped in packages or containers.

2.100 Bulk Carriers

Vessels of larger capacity specially designed for carrying bulk cargoes in large quantities for economic transportation.

2.101 Bulk Handling Plants

Mechanical appliances like conveyor, grain elevator, crane, transporter, staiths, trimmer, hoist, power shovel, straddle carriers, etc, which are used in docks for quick and efficient handling of bulk cargoes for quick turn-round of vessels.

2.102 Bulk Head

A structure separating land and water areas, primarily designed to resist earth pressures.

2.103 Bunkering

The facility for supplying fuel to ship.

2.104 Buoy

A floating object that is anchored to the seabed or attached to another object. It is used as a navigational aid, surface marker, or a loading point for cargoes (*see* single point mooring buoy). Floats that warn of hazards such as rocks or shallow ground, to help ships manoeuvre through unfamiliar harbours.

2.105 Buoy, Anchorage

A buoy used for anchoring of vessels.

2.106 Buoy, Mooring

A transit buoy for mooring a vessel. It may be of any shape or colour (except green).

2.107 Buoy, Pillar

Pillar Buoys are typically the largest of all floating buoys and consist of a tall central structure on a broad base and is used to mark special positions on a coast or in harbour approaches.

2.108 Buoy, Radar-Reflecting

A device designed to reflect radar waves well in order to make it clearly visible on radar screens.

2.109 Buoy, Spar

A spar buoy is a tall, thin buoy that floats upright in the water and is characterized by a small water plane area and a large mass.

2.110 Burtoning System

The system of cargo handling, in which both derrick booms of a vessel are used in conjunction, one of them being rigged and fixed so that its head 'plumbs' the hold, and the other with its head over the ship's side, the ends of the two falls being joined to one hook so as to make one lifting unit.

2.111 By-passing, Sand

Hydraulic or mechanical movement of sand from the accreting updrift side to the eroding downdrift side of the inlet or harbour entrance. The hydraulic movement may include natural as well as movement caused by man.

2.112 Caisson

Caisson is boxlike structure used in construction work underwater or as a foundation. It is usually rectangular or circular in plan but its meaning has been extended, in maritime engineering, to include all hollow structures.

2.113 Caisson Breakwater

A caisson is a box made out of steel-reinforced concrete that are constructed in a sheltered place, temporarily strutted in the interior, launched and towed out to site of construction, sunk in position by admitting water to the interior, filled with fluid concrete, stone rubble, small blocks or sand so as to form ultimately a solid monolith.

2.114 Caisson, Floating

May be either 'box' or 'ship' type caisson with air chambers, ballast chambers and tidal chambers, and moved entirely by floatation, without guides or rollers.

2.115 Caisson, Pneumatic

Caisson constructed of steel or concrete with working chamber, ballast chamber and vertical shafts for passage of workmen and materials, a continuous amount of air at the required pressure being supplied to the working chamber to balance the hydrostatic pressure at the lower or cutting edge of the chamber. This is used for construction of underwater foundations and may be removed after construction or all or part of this may be incorporated in the structure built.

2.116 Caisson, Rolling

A caisson with rectilinear motion achieved by rollers which are attached either to the underside of the caisson or to the pathway on which the caisson travels, whereby abrasion is reduced due to lesser friction than a sliding motion, but may get jammed diagonally due to slight side clearance between the caisson and its sliding ways.

2.117 Caisson, Sliding

A caisson with keels or rubbing plates on its underside by which this is hauled over sliding ways set on the floor of the caisson berth. This method gives rise to a certain amount of friction which may be diminished by suitable floatation adjustment.

2.118 Caisson, Swinging

This is an intermediate class of structure possessing characteristics common to both gates and caissons. Like the gate, it turns or swings upon a vertical axis fixed at one side of a waterway and requires excessive length of side recess for its accommodation when out of use. On the other hand this is built with much broader beam than a gate and this gives it the compensating advantage of a wide roadway at quay level.

2.119 Caisson, Traversing

This includes all those whose motion is rectilinear and, according to the mode of travelling it may be the sliding, rolling or floating type but in any case it occupies a rectangular recess in a side wall at right angle to the axis of the waterway and in direct line with the path along which the caisson travels to close the entrance. It is almost universally of the box type consisting of a floor, side and end plating, and a watertight deck, the whole being divided into compartments.

2.120 Camel

Special craft employed for lifting sunken vessels.

2.121 Capillary Wave

A wave whose velocity of propagation is controlled primarily by the surface tension or the liquid in which the wave is travelling. Water waves of length less than about 25 mm are considered capillary waves. Waves longer than 25 mm and shorter than 50 mm are in an intermediate zone between capillary and gravity waves.

2.122 Cap Log

A horizontal timber on a quay or pier, bolted to the vertical timbers or secured to the masonry to receive the impact of vessels lying alongside.

2.123 Capstan

A quay side mechanical appliance, consisting primarily of a drum which rotates about a vertical axis, used for shunting and manoeuvring railway wagons alongside ships for the purpose of receiving and discharging cargoes (and to assist the movement of vessels through entrance locks and passages, together with the warping of vessels into and out of graving docks and floating docks).

2.124 Cardinal System of Buoyage

Or the 'compass' system of buoyage to indicate dangers existing in confined coastal waters by true bearing of the navigational mark, from danger, on the charts to the nearest cardinal point of the compass. In order to determine the bearing of a danger from a buoy the four quadrants of the compass are divided into sectional areas and bounded by the bearing N.E., S.E., S.W., and N.W., taken from the point of danger.

2.125 Cargo Vessel

The goods or merchandise carried on board a trading vessel.

2.126 Cargo, Bulk

Includes materials like food grain, coal, oil, fertiliser, ore, gravel, sand and similar other, which are transported in bulk quantities and generally handled by special complete mechanical appliances for quick and efficient loading and unloading.

2.127 Cargo, Container

General cargo consisting of small packages and the like, which are transported in special metallic containers of definite sizes for quick handling, saving manpower and money and with minimum wastage.

2.128 Cargo Density of Ships

The content of the ship per lineal metre. This is used for calculating the storage space and shed capacity at the berth.

2.129 Cargo, General

General merchandise in packages or in quantities, the handling of which cannot be completely mechanised.

2.130 Cargo Handling Gear

Includes mechanical appliances for loading and unloading cargoes to and from a ship, which includes cranes of all forms, fork lift trucks, piling and stacking machineries, conveyers, elavators, straddle carriers, etc.

2.131 Cargo Mast

A ship's gear for cargo-handling situated on each side of the vessel, and each respectively in such positions as to command each hatchway. Also called Samson Posts. These along with derricks or booms, winches, blocks, runners, and preventers constitute the ship's cargo handling gear.

2.132 Cargo, Palletised

General cargo, preferably of a more or less homogeneous character, is successfully handled in standard packages or 'pallets', also used for handling small or frail packages. The pallet is strongly constructed of wood in the form of a shallow square or rectangular box usually with two open ends and with the top and bottom formed of open boarding separated by three or more stringers, according to the size of the pallet.

2.133 Cargo Terminal

A transportation facility in which quantities of goods or container cargo are stored without undergoing any manufacturing processes, transferred to other carriers or stored outdoors in order to transfer them to other locations.

2.134 Cargo Throughput

Total volume of cargo discharged and loaded at the port. It includes break bulk, liquid bulk, dry bulk, containerized cargo, transit cargo, and trans shipment.

2.135 Caustic

In refractions of waves, the name given to the curve to which adjacent orthogonals of waves refracted by a bottom whose contour lines are curved, are tangents. The occurrence of a caustic always marks

a region of crossed orthogonals and high wave convergence.

2.136 Central Pressure Index

The estimated minimum barometric pressure in the eye (approximate centre) of a particular hurricane. This is considered the most stable index to intensity of hurricane wind velocities in the periphery of the storm; the highest wind speeds are associated with storms having the lowest central pressure index.

2.137 Channel

- a) A natural or artificial waterway of perceptible extent which either periodically or continuously contains moving water, or which forms a connecting link between two bodies of water.
- b) The part of a body of water deep enough to be used for navigation through an area otherwise too shallow for navigation.
- c) A large strait.
- d) The deepest part of a stream or stream through which the main volume or current of water flows.

2.138 Charnel Demarcation

Safe and speedy navigation within coastal waters depends — apart from charts — upon the establishment of a number of navigational aids of various types to give the ship master warning of rocks, shoals, sandbanks, etc, to assist in the safe movement of vessels within restricted navigable sea approaches, rivers, channels and entrances to ports and also to indicate the alignment of navigational tracks. This is called channel demarcation.

2.139 Channel, Navigable

The channel, properly demarcated by navigational aids, used by ships for navigation.

2.140 Characteristic Wave Height

See Significant Wave Height.

2.141 Chart Datum

The plane or level to which soundings (or elevations) or tide heights are referenced (usually low water datum). The surface is called a tidal datum when referred to a certain phase of tide. To provide a safety factor for navigation, some level lower than mean sea level is generally selected for hydrographic charts, such as Mean Low Water or Mean Lower Low Water or Lowest Astronomical Tide.

2.142 Chelura

A genus of marine amphipod crustacean resembling a shrimp which undercuts woodwork and causes it to fall away in flakes. This insect manifests a decided partiality for pure sea water and is, consequently, more often found along the open coast than in enclosed harbours.

2.143 Chop (also Wind Chop)

The short-crested waves that spring up quickly in a moderate breeze and break easily at the crest.

2.144 Clapotis

The French equivalent for a type of standing wave. It is usually associated with the standing wave phenomenon caused by the reflection of a non-breaking wave train from a structure with a face that is vertical or vertical. Full clapotis is one with 100 percent reflection of the incident wave, partial clapotis is one with less than 100 percent reflection.

2.145 Clearance

The space allowance between the keel of a vessel and the bed surface of a navigable channel to prevent a grounding of the vessel.

2.146 Cnoidal Wave

A type of wave in shallow water (depth of water less than $1/8^{\text{th}}$ to $1/10^{\text{th}}$ the wave length). The surface profile is expressed in terms of the Jacobian elliptic function ' C_{nu} ', hence the name Cnoidal.

2.147 Coast

A strip of land of indefinite width (may be several kms) that extends from the shoreline inland to the first major change in terrain features.

2.148 Coastwise/Domestic Trade

A term applied in a general sense to the trade carried on between ports of the same country.

2.149 Coastal Area

The land and sea area bordering the shoreline.

2.150 Coastal Plain

The plain composed of horizontal or gently sloping strata of elastic materials fronting the coast, and generally representing a strip of sea bottom that has emerged from the sea in recent geologic time.

2.151 Coast Line

- a) Technically, the line that forms the boundary between the coast and the shore.

- b) Commonly, the line that forms the boundary between the land and the water.

2.152 Coffor Dam

A temporary dam constructed of timber, either single skin or double skin, parallel-sided with puddled clay or other filling, or interlocking steel sheetpiling, either single skin or double skin, parallel-sided with the interior pumped dry and strutted, enclosing the site of structure to be built, for the exclusion of water from the site for an underwater construction.

2.153 Comber

- a) A deep water wave whose crest is pushed forward by a strong wind; much larger than a whitecap.
- b) A long period breaker.

2.154 Combined Service Vessel

Vessels specially designed and equipped for carrying out the various combination of services, comprising surveying, buoyage, salvage work, fire-fighting and general conservancy duties.

2.155 Compound Gate

Lock gates are constructed either of wood, iron or steel. But since wood is not durable above water and iron or steel below water, a compound gate is designed with the lower part under water of wood and the upper part of steel.

2.156 Container Berth

A berth generally with a large stacking yard for handling containerised cargo, which may also be used as a general cargo berth.

2.157 Container Freight Station

A warehouse or transit shed adjacent to the container yard used for stuffing and stripping of container cargo.

2.158 Container Terminal

A port facility designed to provide an integrated use of berthing facilities for containership and harbour transport system for containers and their contents.

2.159 Container Yard (CY)

A designated area in a container terminal usually adjacent to the marshalling yard where containers and chassis are received stacked and dispatched.

2.160 Containerisation

The process of handling some types of general cargo in small packages or the like, in containers for rapid and economical transport. Full containerisation not only uses such containers for transport of the cargoes, but the containers are transhipped in specially designed vessels and handled at special container berths also for most economical and quick operations.

2.161 Containerized Cargo

Cargo packed in vans or containers for easy handling and transporting of the same as a unit.

2.162 Continental Shelf

The zone bordering a continent and extending from the low water line to the depth (usually about 200 m) where there is a marked or rather steep descent toward a greater depth or as notified by the country specifically delineating the continental shelf.

2.163 Controlling Depth

The least depth in the navigable parts of a waterway, generally over a crossing or bar, governing the maximum draft of vessels that can enter.

2.164 Convergence

- a) In refraction phenomenon, the decreasing of the distance between orthogonals in the direction of wave travel. Denotes an area of increasing wave height and energy concentration.
- b) In wind set up phenomenon, the increase in set up observed over that which would occur in an equivalent rectangular basin of uniform depth, caused by changes in planform or depth, also the decrease in basin width or depth causing such increase in set up.

2.165 Coping

The top protective covering with hard material like granite, rich concrete, etc, provided at the berthing side of a dock or wharf wall. The top level of this at the water side is the coping level which is fixed with respect to the design water level in the dock.

2.166 Coral

- a) Marine coelenterates, solitary or colonial which form a hard external covering of calcium compounds, or other materials. The corals which form large reefs are limited to warm, shallow waters, while those forming solitary, minute growths

may be found in colder water to great depths (Biology).

- b) The concretion of coral polyps, composed almost wholly of calcium carbonate, forming reefs, and tree-like and globular masses. May also include calcareous algae and other organisms producing calcareous secretions, such as bryozoans and hydrozoans (Geology).

2.167 Cradle

A framework on which a ship or boat rests during construction or repairs.

2.168 Crane, Floating

A crane mounted upon a pontoon, dumb or self-propelled, according to local requirements. These may be of wide range of capacity varying from 5 tonnes to 350 tonnes but generally the capacity varies from 50 tonnes to 200 tonnes. These are mobile and can be propelled or towed from and to the ship; can travel with the lift from shop to quay and vice-versa; can be employed on other works also besides loading and discharging ships and can be employed for off shore loading and unloading.

2.169 Crane, Level Luffing

A crane, whose jib moves inwards and outwards without raising or lowering the load, this offering a valuable economy in both power and time, due to economical working and low maintenance cost. Other advantages of this type of crane are that there is a large clearance underneath the jib, which is of particular value when bulky loads are handled; and owing to the small radius of arc covered by the jib when luffing, the crane can be operated more freely in restricted spaces.

2.170 Crane, Portal

A portal structure carrying a travelling trolley with a hook or a portal structure with a cantilever jib to lift and move the load. It is mostly used in quays, wharves, factory sheds, etc.

2.171 Crane, Semi-Portal

A crane with rear legs supported on rails which may be part of the shed structure, if there is one. It has got the advantage of minimizing obstruction of the quay. Trouble, however, is sometimes caused by unequal settlement of the two foundations unless special means are taken to overcome it.

2.172 Crane, Wharf

A crane provided at a quay or wharf for loading and discharging of vessels. Generally, majority of quay

cranes of modern origin are electrically operated and of the travelling portal cantilever jib type. All have slewing and luffing motion, and most are fitted with level luffing gear.

2.173 Crest Length, Wave

The length of a wave along its crest. Sometimes called crest width.

2.174 Crest of Wave

- a) The highest part of the wave; and
- b) That part of the wave above still water level.

2.175 Crest Width, Wave

See Crest Length, Wave.

2.176 Crib

A hollow box-shaped structural unit constructed with headers and stretchers of timber, bamboo or reinforced concrete filled up with stone rubble, bricks, and brickbats, lean concrete, or earth. These are extensively used in river training works like spurs, groynes, etc. Also used for retaining tipped materials as in dock walls to be constructed in advance of a shoreline or river bank.

2.177 Crossing

A shallower stretch of a navigable channel over which a vessel navigates from one deeper channel to another deeper channel, generally at the opposite banks of a river or a water course.

2.178 Cunnette

An artificial channel excavated in the bed of a river or water course to channelize and guide the flow and to improve the hydraulic condition.

2.179 Current, Coastal — One of the offshore currents flowing generally parallel to the shoreline in the deeper water beyond and near the surf zone. They are not related generally to waves and resulting surf, but may be related to tides, winds, or distribution of mass.

2.180 Current, Drift

A broad, shallow, slow-moving ocean or lake current. Opposite of current, stream.

2.181 Current, Ebb

The tidal current away from shore or down a tidal stream. Usually associated with the decrease in the height of the tide.

2.182 Current, Eddy

See Eddy.

2.183 Current, Feeder

The parts of the near shore current system that flow parallel to shore before converging and forming the neck of the rip current.

2.184 Current, Float

A floating object drifting upon the surface of water to determine the set or direction and velocity of a current. But since the surface is affected by wind and the surface layer of water may flow in a different direction as well as with a different velocity to the lower layers or main body of water, floats should extend some depth into the water so as to partake of the influence of bottom layers. A float, then, generally consists of a floating body submerged to the required depth with an indicator projected above the surface for taking observations.

2.185 Current, Flood

The tidal current toward shore or up a tidal stream. Usually associated with the increase in the height of the tide.

2.186 Current, Inshore

Any current in or landward of the breaker zone.

2.187 Current, Littoral

Any current in the littoral zone caused primarily by wave action, for example, longshore current, rip current.

2.188 Current, Longshore

The littoral current in the breaker zone moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline.

2.189 Current, Periodic

See Current, Tidal.

2.190 Current, Permanent

Current that runs continuously, independent the tides and temporary causes. Permanent currents include the freshwater discharge of a river and the currents that form the general circulatory system of the oceans.

2.191 Current, Rip (also Rip Surf)

A strong surface current flowing seaward from the shore. It usually appears as a visible band of agitated water and is the return movement of water piled

upon the shore by incoming waves and wind. With the seaward movement concentrated in a limited band its velocity is somewhat accentuated. A rip consists of three parts: the feeder current flowing parallel to the shore inside the breakers; the neck, where the feeder currents converge and flow through the breakers in a narrow band or 'rip'; and the head, where the current widens and slackens outside the breakers line. A rip current is often miscalled a rip tide.

2.192 Current, Stream

A narrow, deep, and swift ocean current. Opposite of current, drift.

2.193 Current System, Nearshore

The current system caused primarily by wave action in and near the breaker zone, and which consists of four parts. The shoreward mass transport of water; longshore currents; seaward return flow, including rip currents; and the longshore movement of the expanding heads of rip currents.

2.194 Current, Tidal (also Current, Periodic)

The alternating horizontal movement of water associated with the rise and fall of the tide caused by the astronomical tide producing forces.

2.195 Cusp (also Beach Cusp)

One of the series of low mounds of beach material separated by crescent shaped troughs spaced at more or less regular intervals along the beach face.

2.196 Cusate Bar

A crescent shaped bar uniting with the shore at each end. It may be formed by a single spit growing from shore and then turning back to again meet the shore, or by two spits growing from the shore and uniting to form a bar of sharply cusate form.

2.197 Cutter Suction Dredger

A dredger which works on principle of suction with a cutter head fitted at the end of the suction pipe for removing materials like clays, and indurated cohesive materials other than rock.

2.198 Cycloidal Wave

A deep, symmetrical wave whose crest forms an angle of 120 degrees. The wave form is that of a cycloid. A trochoidal wave of maximum steepness (*see also Trochoidal Wave*).

2.199 Cyclones (Elevating Plant)

A dust chamber attached to a pneumatic grain elevating plant to catch the dust present with the grain which otherwise would be lost through the exhausts after passing through air pumps.

2.200 Daily Retardation (of Tides)

The amount of time by which corresponding tidal phases grow later day by day (about 50 min).

2.201 Dead Weight Tonnage (DWT)

It is the weight in tons of 2 240 lb of cargo, stores, fuel, passengers and crew carried by the ship when loaded to her maximum summer load line.

2.202 Deadweight Tonnage (DWT)

The total carrying capacity of a ship expressed in long tons (1 016.047 kg) on a specified draft. The deadweight tonnage includes the total weight of cargoes, fuel, water in tanks, stores, baggage, passengers, crew, and their effects but exclude the water in the boilers.

2.203 Dead Weight Tonnage

A measure of how much weight a ship can carry. It is the sum of the weights of cargo, fuel, fresh water, ballast water, provisions, passengers, and crew.

2.204 Debris Line

A line near the limit of storm wave uprush marking the landward limit of debris deposits.

2.205 Decay Distance

The distance waves travel after leaving the generating area (fetch).

2.206 Decay of Waves

The change waves undergo after they leave a generating area (fetch) and pass through a calm, or region of lighter winds. In the process of decay, the significant wave height decreases and the significant wave length increases.

2.207 Deck

The top working platform of a structure/ship. A ship may have several decks used for accommodation, storage of cargo and as working decks.

2.208 Deck Load

The dead and live load on the deck.

2.209 Deep Water

Water so deep that surface waves are little affected by the bottom configuration. Generally, water deeper than one half the surface wave length is considered deep water.

2.210 Deflation

The removal of loose material from a beach or other land surface by wind action.

2.211 Deflection (of Wave)

The change in the direction of propagation of wave when the wave is interrupted by a barrier.

2.212 Depositing Dock

A floating dock in which one of the sides is suppressed. It is utilized to lift and deposit vessels upon fixed stagings set up on the shore line and also for launching purposes in the case of large hollow reinforced concrete blocks for harbour construction work, though the use is very limited.

2.213 Depression, Bay

A low pressure zone over sea which may give rise to high velocity winds which may develop into a cyclone.

2.214 Depth

The vertical distance measured at the middle of the vessel's length from top of keel or top of ceiling to top of upper deck at sides or amidships.

2.215 Depth of Breaking (also Breaker Depth) — The still water depth at a point where the waves start breaking.

2.216 Design Wave — The wave whose characteristics are considered for the design of a maritime structure to withstand the wave action.

2.217 Diffraction (of Water Waves) — The phenomenon by which energy is transmitted laterally along a wave crest. When a part of a train of waves is interrupted by a barrier, such as a breakwater the effect of diffraction is manifested by propagation of waves into the sheltered region within the barrier's geometric shadow.

2.218 Dike (Dyke)

A wall or mound built around a low lying area to prevent flooding.

2.219 Disembarkation

The act of landing or going ashore from a ship.

2.220 Diurnal Tide

A tide with one high water and one low water in a tidal day (24 h and 50 min).

2.221 Divergence

- a) In refraction phenomenon, the increasing of distance between orthogonals in the direction of wave travel. Denotes an area of decreasing wave height and energy concentration.
- b) In wind set-up phenomenon, the decrease in set—up observed under that which would occur in an equivalent rectangular basin of uniform depth, caused by changes in planform or depth. Also the increase in basin width or depth causing such decrease in set up.
- c) In tidal phenomenon, the difference in the direction of ebb and flood flow at a section of a river or waterway.

2.222 Dock

A basin or area of water for ships partially enclosed or unenclosed and open to the tides. It is an artificial basin into which vessels are brought for inspection and repair.

2.223 Dockage Report

A form used by computerized and noncomputerized port which specifies the name of vessel, voyage number, flag registry, ship operator/owner, vessel particulars (GRT, LOA) port calls, (last/next) and vessel movement from anchorage up to departure from berth.

2.224 Dock Basin

See Basin.

2.225 Dock, Dry (also Graving Dock)

A dock from which water can be temporarily excluded by natural or artificial means, in order that repairs to the hulls and keels of vessels may be effected.

2.226 Dock Sill

The platform or flooring at the entrance of a dry dock. The timber or foundation against which the gates of a dock or lock shut.

2.227 Dock, Wet

Area of impounded water within which vessels can remain afloat at a uniform level, independent of external tidal condition.

2.228 Dolphin

An isolated marine structure for mooring or guiding vessels.

2.229 Dolphin, Mooring

A dolphin with a head upon a cluster of piles, which may be either vertical or a combination of vertical and rakers, used for offshore mooring of vessels.

2.230 Dolphin, Berthing

A dolphin with a head upon a cluster of piles, which may be either vertical or a combination of vertical and rakers to assist in berthing of vessels by taking up some berthing loads and to keep the vessel from pressing against the pier structure.

2.231 Doodson's Machine (Tide Prediction)

A machine adopted by Doodson on the principles suggested by Lord Kelvin for the prediction of daily times and heights of tides at a location, from the different harmonic constituents of the tide.

2.232 Double Tides

Occurrences of high water in pairs within a period of 24 h to 25 h, as against the usual two, separated by a slight interval, that is, the tidal curve shows a double headed high water.

2.233 Down/Idle Time

The total time work on the vessel actually comes to a stop.

2.234 Down Drift

The direction of predominant to which movement of littoral materials.

2.235 Draft (Draught)

The depth to which a vessel is submerged above the keel in water during navigation.

2.236 Draft Maximum

The deepest draft of a vessel measured upon arrival and upon departure.

2.237 Draft of Vessel

The depth of the ship measured vertically from the waterline to the lowest part of the vessel's hull, propellers or other reference point.

2.238 Dragline Dredger (Tension Cable Dredger)

Developed on the principles of dragline and used primarily for digging sand and gravel out of deep pits.

2.239 Dredger

A plant employed for an operation involving the removal of material under water from the bed of a water area whether the mode of action be dragging, sucking or digging.

2.240 Dredger, Bucket Ladder

See Bucket Ladder Dredger.

2.241 Dredger, Cutter Suction

See Cutter Suction Dredger.

2.242 Dredger, Dipper

It consists of a single bucket at the end of a long arm and mounted upon a barge in any suitable position and usually held in position for dredging by means of three or four spuds, without any external mooring. The bucket after being lowered at the required location makes a curved upward cut, the contents being discharged into a hopper through the bottom of the hinged bucket. It has a large degree of mobility and can dig its own floatation through a bank not only below water level but extending a few metres above that level.

2.243 Dredger, Grab (Grapple or Clam—Shell Dredger)

This consists of segmental scoops, generally formed of two quadrants which rotate about a central pivot and which on meeting in closed position, forms a semi-cylindrical receptacle or bucket. May also be constructed with spherical sides in two or three parts, which is adapted to excavation for circular well foundation.

2.244 Dredger, Jet

A dredger operated by agitating the bed at the region of operation by means of a jet of water under high pressure injected from a nozzle, whereby the bed material is brought into suspension which is either carried away by current or removed by a suction dredger according to the site condition. This is suitable for dredging fine grain sandy bed.

2.245 Dredger, Suction (Hydraulic or Sand Pump Dredger)

Consists essentially of a continuous pipe or tube through which, by means of suitable machinery, sand or other light material is sucked up from the

bottom, which may be directly pumped out to the disposal site or delivered into hopper from where the material is disposed of after settling. The suction dredger is most suitable for operation in deep deposit of sand so that the suction nozzle may obtain a full and continuous feed without much need to traverse the dredger, and also with materials of great fineness and low specific gravity, such as silt and mud.

2.246 Dredging

It is periodic removal of material from the seabed in approach channels to port and harbour basins to maintain widths and depths in previously dredged areas to ensure the safe access for vessels.

2.247 Drift

- a) Sometimes used as a short form for littoral drift.
- b) The speed at which a current runs.
- c) Floating material deposited on a beach.
- d) A deposit of a continental ice sheet, as a drumlin.

2.248 Drift Current

A broad, shallow, slow moving ocean or lake current.

2.249 Drift, Littoral

Sedimentary material moved in the littoral zone under the influence of waves and current.

2.250 Drill Boat — A craft in the form of rectangular, flat-bottomed and decked barges, usually without propulsion, and held in position by spuds at each corner. This carries four or five drilling rigs consisting of vertical frames on rails, each with its own power-driven drilling winch for drilling and blasting hard bed rock under water.

2.251 Dry Bulk

This pertains to unpacked solid goods.

2.252 Duration

In wave forecasting, the length of time the wind blows in nearly the same direction over the fetch, that is the generating area.

2.253 Duration, Minimum

The time necessary for steady state wave conditions to develop for a given wind velocity over a given fetch length.

2.254 Dwell Time

The number of hours spent by a vessel from waiting time to berth until the time of completion of the un-berthing process on final departure.

2.255 Eager

See Bore.

2.256 Ebb Current

The tidal current away from shore or down a tidal stream caused by the falling tide. It is seaward flow in estuaries or tidal rivers during a tidal phase of lowering water level.

2.257 Ebb Tide

The period of tide between high water and the succeeding low water; a falling tide.

2.258 Echo Sounder

An electronic instrument used to determine the depth of water by measuring the time interval between emission of a sonic or ultrasonic signal and the return of its echo from the bottom. The process of determining the depth by such appliance is known as echo sounding.

2.259 Eddy (also Eddy Current)

A circular movement of water formed on the side of a main current. Eddies may be created at points where the main stream passes projecting obstructions or where two adjacent currents flow counter to each other.

2.260 Edge Wave

An ocean wave parallel to a coast, with crests normal to the shoreline. An edge wave may be standing or progressive. Its height diminishes rapidly seaward and is negligible at a distance of one wavelength offshore.

2.261 Elevator, Bucket-Belt

A mechanical grain handling elevator consisting of a series of mild steel buckets, rivetted to an endless belt, working round top and bottom drums, the top one being the driving drum and the bottom one tensioning drum.

2.262 Elevator, Floating Grain

Bucket elevator mounted on pontoon or barge for discharging grain from ship to shore at places where there is no fixed shore plant, or for discharging from ship to barge or other vessel. Such floating appliances generally include sacking spouts and weighing machines.

2.263 Elevator, Pneumatic

An elevator for raising the grain from the ship's hold through pipes in which it is entrained in an air current induced by vacuum pumps. The pipes are flexible and terminate in a special form of suction nozzle, which can be placed by hand in any part of the ship's hold.

2.264 Embarkation

The act of boarding a vessel or ship.

2.265 Energy Coefficient

The ratio of the energy in a wave per unit crest length transmitted forward with the wave at a point in shallow water to the energy in a wave per unit crest length transmitted forward with the wave in deep water. On refraction diagrams this is equal to the ratio of the distance between a pair of orthogonals at a selected point to the distance between the same pair of orthogonals in deep water. Also the square of the refraction coefficient.

2.266 Energy, Wave

Average energy of a wave over one wave length and is a combination of kinetic and potential energies.

2.267 Entrance

The avenue of access or opening to a navigable channel.

2.268 Entrance Channel

The navigation channel from deep water to the dock.

2.269 Entrance Width

The minimum width provided for the entrance channel at the entry to dock either between breakwaters enclosing the dock or in the lock entrance.

2.270 Erosion

The wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

2.271 Estuarine Pollution

The contamination of the estuary of a river causing danger to human and marine life by sewage and industrial by products discharged into water in the vicinity.

2.272 Estuary

The wide stretch of a river near the sea, which is affected by the tides.

2.273 Estuary, Stratified

An estuary where the fresh water of the river and the saline water of the sea form distinct layers or strata.

2.274 Estuary, Well-Mixed

An estuary where the fresh water of the river and the saline water of the sea are in a well mixed condition without forming any distinct strata.

2.275 Eye (of a Hurricane)

The roughly circular area of comparatively light winds and fair weather found at the centre of a severe tropical cyclone.

2.276 Faggotting

A type of bank protection work formed of twiggy branches of thorn, willow, hazel, birch, oak or elm, usually 1.2 to 1.5 m long and 0.9 m in circumference, laid normally to the shoreline, usually horizontally or with a slight slope backwards. These are used usually in situations where grass and other plants are unsuitable and where there is little or no wave action or wash and in silt-laden water.

2.277 Fairlead

Small, horizontal, single sheaves appliance fixed on the quay surface on lock sides and at dry docks for altering the lead of ropes to capstans.

2.278 Fairway

The parts of a waterway that are open and unobstructed for navigation. The main travelled part of a waterway; a maritime thoroughfare.

2.279 Feeder Beach

An artificially widened beach serving downdrift beaches by natural littoral currents or forces.

2.280 Fender

A type of resilient buffer system provided at a berthing face to protect the structure and the ship from damage due to force of impact of berthing vessel.

2.281 Fender, Floating

A floating body, like a timber truss, tied in front of a quay surface and extending quite a distance from the quay surface, so that the impact force of a berthing vessel is first taken up by the floating body without

the vessel coming in direct contact with the quay edge.

2.282 Fender, Pile

A system of piles, vertical and/or raker, provided in front of a quay surface to take up the direct impact force from a berthing vessel.

2.283 Fender, Suspended

These are fenders making use of gravitational forces to oppose the impact blow. There are a variety of types, the majority aiming at complete absorption of the kinetic energy of the berthing vessels. The commonest form is made of ballasted steel tubes of heavy weight suspended by links from the main structure so that the tubes rise vertically during horizontal motion from impact force thus absorbing the kinetic energy of impact.

2.284 Fetch (also Generating Area)

The area in which seas are generated by a wind having a rather constant direction and speed. Sometimes used synonymously with fetch length.

2.285 Fetch Length

The horizontal distance (in the direction of the wind) over which a wind generates seas or creates a wind set up.

2.286 Flexible Wall

A wall, like a sheet pile wall, which can take considerable deflection with differential movements induced in the active and passive wedges of soil, without failure of the structure.

2.287 Fleeting

The area at which barges, towboats and tugs are berthed until needed. The operation of building or dismantling barge tows.

2.288 Floating Breakwater

See Breakwater, Floating.

2.289 Floating Caisson

See Caisson, Floating.

2.290 Floating Crane

See Crane, Floating.

2.291 Floating Dock

A repairing dock working on hydraulic lift principle. It is a hollow structure of steel or reinforced concrete with air chambers to fill with water to sink the dock

to the requisite depth for receiving its charge, the water being pumped out when the vessel is berthed. It has the advantage of mobility and less maintenance cost but requires a large depth of water inside a sheltered area for its operation.

2.292 Flood Tide

The period of tide between low water and the succeeding high water; a rising tide.

2.293 Fluorescent Tracer

A tracer obtained by dyeing materials having the same specific gravity and grain size as the bed materials with fluorescent dye. Used for studying the mode of sediment transport (bed load) in a river, estuary or coastal area.

2.294 Foam Line

The front of a wave as it advances shoreward, after it has broken.

2.295 Following Wind

Generally, same as tailwind; in wave forecasting, wind blowing in the direction of ocean wave advance.

2.296 Fore Runner

Low, long period ocean swell which commonly precedes the main swell from a distant storm, especially a tropical cyclone.

2.297 Foreign Trade

A term applied to the trade carried on between a Law of land (location) port and a foreign port.

2.298 Foreshore

The part of the shore lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall (*see* also Beach Face).

2.299 Forward Speed (of Hurricane)

Rate of movement (propagation) of the hurricane eye in km/h or knots.

2.300 Free Board

- a) The additional height of a structure above design high water level to prevent overflow. Also, at a given time, the vertical distance between the water level and the top of the structure.

- b) On a ship, the distance from the waterline to the top of the deck line.

2.301 Freight

The price paid to a ship owner for the transport of goods or merchandise by sea from one specific port to another. The word freight is also used to denote goods which are in the process of being transported from one place to another.

2.302 Freshet Flow

The quantity of water discharge at the upstream end of a river or channel.

2.303 Front of the Fetch

In wave forecasting, the end of the generating area toward which the wind is blowing.

2.304 Full Container Load (FCL)

A container loaded with cargoes belonging to one consignee covered by one bill of lading and meant for door-to-door delivery.

2.305 Gang

A group of cargo workers employed to work in a hatch.

2.306 Gate, Lock

A gate used for maintaining a constant water level in enclosed water area.

2.307 Gate, Mitre

A lock gate with two hinged flaps meeting at a point when the gate is closed.

2.308 Gate, Sector

A lock gate used for canal locks and lock entrances to dock system with reversible water levels on either side of the gate so that the gate has to withstand resultant water pressure from either side. In such a gate the single skin plating resisting the water pressure is struck to an arc of a circle, so that the resultant force passes through the vertical axis on which the gates revolve.

2.309 Gate, Storm

Employed in entrances subjected to periodic floods and exceptionally high tides accompanied by cyclones and stormy weather. During such periods it is often necessary to exclude part of the tidal water from a dock, and the gates consequently point in the opposite direction to those used for impounding water.

2.310 Gate, Vertical Lift

A gate with the leaf lifted vertically upwards during opening the entrance as in a sluice. This is suitable for small entrances as in canals, etc.

2.311 Generating Area (also Fetch)

In wave forecasting, the continuous area of water surface over which the wind blows in nearly a constant direction. Sometimes used synonymously with fetch length.

2.312 Generation of Wave

- a) The creation of waves by natural or mechanical means.
- b) The creation and growth of waves caused by wind blowing over a water surface for a certain period of time. The area involved is called the generating area or fetch.

2.313 Geometric Shadow

In wave diffraction theory, the area outlined by drawing straight lines paralleling the direction of wave approach through the extremities of the protective structure. It differs from the actual protected area to the extent that the diffraction and refraction effects modify the wave pattern.

2.314 Geomorphology

That branch of both physiography and geology which deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of land form.

2.315 Grab Dredger

See Dredger, Grab.

2.316 Graving Dock

Synonymously used with dry dock. Rigorously defined, when the vessel is floated into the dock, and the water removed by natural or artificial means, the term graving dock is appropriate.

2.317 Gravity Wave

A wave whose velocity of propagation is controlled primarily by gravity. Water waves more than 50 mm long are considered gravity waves. Waves longer than 25 mm and shorter than 50 mm are in intermediate zone between capillary and gravity waves.

2.318 Gribble

A species of shipworm (*limmoria/terebrens*) much smaller than the *teredo navalis*, very much

destructive to submerged timber. It bores its way to and fro in the wood.

2.319 Gross Gang — Hours

The total number of hours rendered by gangs in discharging and loading cargo, including the gangs idle time. This is computed by obtaining the difference between the time the gang started and the time they finished work.

2.320 Gross Registered Tonnage (GRT)

The total measured cubic contents of a vessel expressed in units of 2.83 m³.

2.321 Gross Registered Tonnage or Gross Tonnage

This is the volume of all enclosed spaces of a ship. The measure of the internal volume of space within a vessel expressed in terms of 100 cubic feet a ton, except for the following spaces: shelter deck spaces with permanent middle line openings at least four feet long, lavatories for officers and crew, shelters for deck passengers on short voyages, condensed space, close-in spaces solely for machinery, cookhouse and bakeries, wheelhouse. Since 1994 when the results of the 1969 International Tonnage Measurement Convention came into force, Gross Registered Tonnage (GRT) has been referred to as Gross Tonnage (GT).

2.322 Grounding

The phenomenon of a vessel getting struck at the bottom of a waterway due to shallow depth.

2.323 Groyne (also Groin)

A short protection structure of permeable or impermeable type, built usually perpendicular to the shore line or at a small angle from the perpendicular to trap littoral drift or retard bank or shore erosion.

2.324 Groyne System

A series of parallel groins constructed at a fixed spacing acting together to protect a section of river bank or sea beach. Commonly called a groyne field.

2.325 Ground Swell

A long high ocean swell; also this swell as it rises to prominent height in shallow water.

2.326 Group Velocity

The velocity of wave group. In deep water it is equal to one half the velocity of individual waves within the group.

2.327 Gut

- a) A narrow passage, such as a strait or inlet.
- b) A channel in otherwise shallower water, generally formed by water in motion.

2.328 Half Tide Level

See Mean Tide Level.

2.329 Harbour

A protected part of the sea, lake or other body of water used by vessels as a place of safety.

2.330 Harbour, Artificial

A harbour constructed artificially by protective works at a seaface, estuary or on a navigable river to provide necessary shelter and protection to vessels, where there is little or no pronounced natural feature around the locality to afford any protection.

2.331 Harbour, Commercial

This forms essential feature of ports engaged in foreign and coastal traffic. This constitutes the great terminus of the highways of the sea, providing accommodation for the mercantile marine during the operations of loading and discharging cargoes and for the transaction of trade.

2.332 Harbour, Estuarine

A natural or artificial harbour situated at the estuary of a river.

2.333 Harbour, Island

A harbour situated on an island, which usually can accommodate very deep drafted vessels like tankers. Generally it is associated with the handling of oil which is pumped to the main land area through submarine or floating pipelines.

2.334 Harbour, Natural

A harbour formed entirely by an inlet from the sea. This may be constituted by headlands or projecting parts of a coast converging towards each other, with more or less narrow entrance leading to a sheltered expanse of water, also by coral reefs fringing along coast line or series of islands, forming lagoons, with gaps in the reef as entrances. This does not require protective or formative works.

2.335 Harbour of Refuge

The principal duty of such harbour is to provide a refuge for vessels overtaken by sudden stress of weather, or otherwise hard pressed or disabled. The term is now a little out of date because there are not

many such harbours in existence and few are likely to be constructed. Those originally contrived for this purpose are now associated with other port and harbour facilities.

2.336 Harbour Oscillation (also Harbour Surging)

The non-tidal vertical water movement in a harbour or bay. Usually the vertical motions are low, but when oscillations are excited by a tsunami or storm surge, they may be quite large. Variable winds, air oscillations, or surf beat may also cause oscillations.

2.337 Harbour, Protected

Formed primarily in bays or such like indentations in the coast line and by the construction of breakwaters or entrance moles, give protection from wave-action to vessels using or entering the harbour.

2.338 Harbour Resonance

Oscillation induced in a harbour from a disturbance like tide storm, tsunami, etc, the oscillation being much amplified to the outside disturbance due to the harbour having the same natural frequency as the outside disturbance due to defective design which leads to great damage to harbour structures and vessels anchored the harbour.

2.339 Harbour, Riverine

A harbour situated inland on a river away from the sea.

2.340 Hatch

An opening in a vessel's deck through which cargo can be lowered.

2.341 Head of Rip

The part of a rip current that has widened out seaward of the breakers (*see* also Current, Rip; Current, Feeder; Rip).

2.342 Height of Wave

See Wave Height.

2.343 Hexapod

A reinforced concrete structural unit with six projecting legs from a central core.

2.344 Hi-Fix

An electronic arrangement used for finding out the position of vessels.

2.345 High Tide, High Water (HW)

The maximum elevation reached by each rising tide (*see* Tide).

2.346 High Water Line

In strictness, the intersection of the plane of mean high water with the shore. For specific occurrences, the highest elevation on the shore reached during a storm or rising tide, including meteorological effects.

2.347 High Water of Ordinary Spring Tides (HWOST)

A tidal datum based on high water of ordinary spring tides.

2.348 Higher High Water (HHW)

The higher of the two high waters of any tidal day. The single high water occurring daily during periods when the tide is diurnal is considered to be a higher high water.

2.349 Higher Low Water (HLW)

The higher of two low waters of any tidal day.

2.350 Hind Casting, Wave

The use of historic synoptic wind charts to calculate wave characteristics that probably occurred at some time past.

2.351 Hinterland

The hinterland of a stretch of coast or a large river is the area of land behind it or around it, which directly influences the commerce through a port.

2.352 Hook

A spit or narrow cape of sand or gravel which turns landward at the outer end.

2.353 Hopper

A hollow structure usually with a large capacity to which material is discharged.

2.354 Hopper Barge

A hopper barge is a marine vessel designed for transporting dry bulk goods, ranging from garbage to grains.

2.355 Hopper Dredger

A dredger provided with one or more hoppers for holding the dredged materials prior to final disposal.

2.356 Hull

A hull is the watertight body of a vessel exclusive of masts, yards, sails, rigging, machinery and equipment. The hull may open at the top, or it may be fully or partially covered with a deck.

2.357 Hurricane

An intense tropical cyclone in which winds tend to spiral inward toward a core of low pressure, with maximum surface wind velocities that equal or exceed 120 km/h for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 120 km/h.

2.358 Hurricane Path or Track

Line of movement (propagation) of the eye of the hurricane through an area.

2.359 Hurricane Stage Hydrograph

A continuous graph representing water level stages that would be recorded in a gauge well located at a specified point of interest during the passage of a particular hurricane, assuming that effects of relatively short—period waves are eliminated from the record by damping features of the gauge well. This includes effects of astronomical tides, barometric pressure differences and all other factors that influence water level stages.

2.360 Hurricane Surge Hydrograph

A continuous graph representing the difference between the hurricane stage hydrograph and the water stage hydrograph that would have prevailed at the same point and time if the hurricane had not occurred.

2.361 Hurricane Wind Pattern (Isovel Pattern)

An actual or graphical representation of near surface wind velocities covering the entire area of a hurricane at a particular instant. Isovels are lines connecting points of simultaneous equal wind velocities, usually referenced 9 m above the surface in km/h; wind direction at various points are indicated by arrows or deflection angles on the isovel charts. Isovel charts are usually prepared 1 at each hour during a hurricane, but for each half-hour during critical periods.

2.362 Hydrographic Survey

Hydrographic survey is the survey of physical features present underwater. It is the science of measurement and description of features which affect maritime navigation, marine construction, dredging, offshore oil exploration/offshore oil drilling and related activities.

2.363 Hydrography

- a) A configuration of an underwater surface including its relief, bottom materials, coastal structures, etc.
- b) The description and study of seas, lakes, rivers and other waters.

2.364 Hyperbolic Navigational Aids

Navigational aids which in their operation are based upon measurement of the difference in time taken by a radio signal wave travelling from two fixed stations on shore to a ship, which gives a measurement of the difference in range of the two stations, since points at which the difference is constant lie on a position line which is in the form of a hyperbola. A similar measurement from another pair of stations provides another position line and hence a 'fix'.

2.365 Hypothetical Hurricane (Hypo-Hurricane)

A representation of a hurricane, with specified characteristics, that is assumed to occur in a particular study area, following a specified path and timing sequence.

- a) Transposed — A hypo-hurricane based on the storm transposition principle is assumed to have wind patterns and other characteristics basically comparable to a specified hurricane of record, but is transposed to follow a new path to serve as a basis for computing a hurricane surge hydrograph that would be expected at a selected point.
- b) Hype-Hurricane Based on Generalised Parameters — Hypo-hurricane estimates based on various logical combinations of hurricane characteristics used in estimating hurricane surge magnitudes corresponding to a range of probabilities and potentialities.
- c) Standard Project Hurricane (SPH) — A hypothetical hurricane intended to represent the most severe combination of hurricane parameters that is reasonably characteristic of a specified region, excluding extremely rare combinations. It is further assumed that the SPH would approach a given project site from such direction, and at such rate of movement as to produce the highest hurricane surge hydrograph, considering pertinent hydraulic characteristics of the area.
- d) Probable Maximum Hurricane — A hypo-hurricane that might result from the most severe combination of hurricane parameters that is considered reasonably

possible in the region involved, if the hurricane should approach the point under study along a critical path and at optimum rate of movement.

- e) **Design Hurricane** — A representation of a hurricane with specified characteristics that would produce hurricane surge hydrographs and coincident wave effects at various key locations along a proposed project alignment. It governs the project design after economics and other factors have been duly considered.

2.366 Impact Force on Berthing

The force exerted on a berth or quay face or dolphins of jetty or on the ship by a berthing vessel due to its great momentum. A good quantum of the impact force is generally absorbed by adequate fendering system so that the structure is not damaged.

2.367 Impermeable Groin

A groin through which sand and sediment cannot pass.

2.368 Impounded Dock

A dock, the entrance to which is closed by structures like lockgates or caissons, to maintain a constant level of water inside the dock irrespective of the outside water level and tidal or wave effects.

2.369 Indian Spring Low Water (also Indian Tide Plane)

A tidal low water datum, designed for regions of mixed tides, that is depressed below mean sea level by the sum of the amplitudes of the principal semidiurnal lunar and solar tides and the principal diurnal tides, originally developed for parts of the Indian Ocean and along the east coast of Asia.

2.370 Indian Tide Plane

The datum of Indian spring low water.

2.371 Infrastructure

The fixed and immovable parts of a harbour such as land, roads, quay walls and breakwaters.

2.372 Inshore (Zone)

In beach terminology, the zone of variable width extending from the low water line through the breaker zone.

2.373 Inshore Current

See Current, Inshore.

2.374 Insular Shelf

The zone surrounding an island extending from the line of permanent immersion to about 180 m of depth, where a marked or rather steep descent toward the great depths occurs.

2.375 Intermediate Port

An intermediate port which is intermediate between the big major ports and the small minor ports, as defined by the proper authority in a country.

2.376 Internal Waves

Waves that occur within a fluid whose density changes with depth, either abruptly at a sharp surface of discontinuity (an interface) or gradually. Their amplitude is greatest at the density discontinuity or in the case of gradual density change, somewhere in the interior of the fluid and not at the free upper surface where the surface waves have their maximum amplitude.

2.377 Irrotational Wave

A wave with fluid particles that do not revolve around an axis through their centres, although the particles themselves may travel in circular or nearly circular orbits. L-rotational waves may be progressives, standing, oscillatory or transitory (*see* Trochoidal Wave).

2.378 Island Harbour

See Harbour, Island.

2.379 Isobath

An imaginary line or a line on a map or chart that connects all points having the same depth below a water surface.

2.380 Isovel Pattern

See Hurricane Wind Pattern.

2.381 Jet Dredger

See Dredger, Jet.

2.382 Jetty

- a) A structure jutting out from the shore at which vessels are berthed either at the head of the structure or alongside. Often used synonymously with pier.
- b) On open sea coasts or rivers, a structure extending into a body of water and designed to prevent shoaling of a channel by littoral materials or sediment discharge,

and to direct and confine the stream or tidal flow (American usage).

2.383 Keel

The chief structural member of a boat or ship that extends longitudinally along the center of its bottom and that often projects from the bottom.

2.384 Keel Block

See Blocks, Keel.

2.385 Key

A low insular bank of sand, coral, etc.

2.386 Knoll

A submerged elevation of rounded shape rising less than 1 000 metres from the ocean floor, and of limited extent across the summit (*see* Sea Mount).

2.387 Lagging

See Daily Retardation (of tides).

2.388 Lagoon

A shallow body of water, as a pond or lake, usually connected to the sea.

2.389 Landing Stage

A landing stage is a platform built over water where boats stop to let people get off, or to load or unload goods as well as passenger traffic from a vessel to land and vice versa in tidal water which rises and falls with the tide and is connected to the shore. It provides a landing place at a constant level in respect to the vessel.

2.390 Lash

Lighter aboard ship. A modern design in ship construction in which a large carrier with a deep draft accommodates several small crafts within it.

2.391 Lateral System of Buoyage

The system, decided at the International Conference at Geneva in 1936 of marking buoys with visible and night signals to indicate the lateral limits and axes of navigable channels, natural dangers, wrecks and similar obstructions, and certain other points of importance to mariners within or near a navigation channel.

2.392 Leading in Lights

Lights placed at each side of dock and harbour approach channels to enable pilots to position vessels in channels.

2.393 Leading Jetty (Warping Jetty)

A structure provided at the entrance of a dock or lock for easy manoeuvring of vessels to and out of the dock. The structure may be a solid masonry monolith, piled or sheet piled as in a dock wall. This is provided with necessary appliance like capstans, fairleads, etc, for stowage, and with adequate fendering arrangement.

2.394 Length of Wave/ Wave Length

The horizontal distance between similar points on two successive waves measured perpendicularly to the crest.

2.395 Length Overall (LOA)

The total length from the foremost to the aftermost points of a vessel's hull.

2.396 Less Container Load (LCL)

A container loaded with cargoes belonging to two or more consignees.

2.397 Levee (Dike, Embankment, Dyke, Floodbank, or Stop Bank)

A structure that is usually earthen and that often runs parallel to the course of a river in its floodplain or along low-lying coastlines.

2.398 Light Float

A boat like structure (smaller than a light vessel and usually unmanned) used instead of a light buoy in waters where strong streams or currents are experienced, or when a greater elevation than that of a light buoy is necessary.

2.399 Light House

A structure situated in a vantage position and rising to a considerable height above water level and provided with a light at the top of the structure for navigational guidance.

2.400 Light Orders

For the purpose of classification, the lights of light houses, light beacons and light vessels are divided into a series of orders according to their focal distances. But now it is more usual to identify a lens merely by stating its focal distance in millimetres. These are divided into the categories like hyper-radial, meso-radial, 1st, 2nd, 3rd, 4th, 5th and 6th order with focal length varying from 140 mm to 1 330 mm.

2.401 Light Vessel

A vessel used for marking certain navigational dangers like sands, shoals, small submerged pinnacle rocks, etc, which are most easily and economically marked by such a floating craft in heavy seas and strong currents where a luminous buoy is inadequate and unsafe.

2.402 Lighter

A lighter is a type of flat-bottomed barge used to transfer goods and passengers to and from moored ships.

2.403 Littoral

Pertaining to a shore, especially of the sea.

2.404 Littoral Current

See Current, Littoral.

2.405 Littoral Deposits

A marine deposit laid down between low and high tide marks usually consisting of boulders, pebbles and coarse sand.

2.406 Littoral Transport

Littoral transport is the term used for the transport of non-cohesive sediments, i.e. mainly sand, along the foreshore and the shore face due to the action of the breaking waves and the longshore current. The littoral transport is also called the longshore transport or the littoral drift.

2.407 Littoral Transport Rate

Rate of transport of sedimentary material parallel to or perpendicular to the shore in the littoral zone. Usually expressed in cubic metres per year. Commonly used as synonymous with Longshore Transport Rate.

2.408 Littoral Zone

The littoral zone or nearshore is the part of a sea, lake, or river that is close to the shore. In coastal environments, the littoral zone extends from the high water mark, which is rarely inundated, to shoreline areas that are permanently submerged.

2.409 Load

The quantity of sediment transported by a current. It includes the suspended load of small particles and the bed load of large particles that move along the bottom.

2.410 Loading

The operation of transferring cargo from the quay of barge into the hold or on to the deck of a ship. It is

not complete until the cargo has been removed from the slings and placed in the hold or on the deck of a vessel.

2.411 Lock (also Lock Entrance)

The structure provided at the entrance of an impounded dock for maintaining the required level of water in the dock for easy and safe berthing of vessels in the dock, by means of gates or caissons.

2.412 Lock Entrance

Same as Lock.

2.413 Lock Gate

See Gate Lock.

2.414 Lo-lo (lift-on lift-off)

Cargo handling method by which vessels are loaded or unloaded by either ship or shore cranes.

2.415 Longshore Bar

A ridge of sand, gravel, or mud built on the seashore by waves and currents, generally parallel to the shore and submerged by high tides.

2.416 Longshore Current

See Current, Longshore.

2.417 Longshore Transport Rate

Rate of transport of sedimentary material parallel to the shore. Usually expressed in cubic metres per year. Commonly used as synonymous with littoral transport rate.

2.418 Loop

That part of a standing wave where the vertical motion is greatest and the horizontal velocities are least. Loops (sometimes called antinodes) are associated with clapotis and with seiche action resulting from wave reflections.

2.419 Low Water, Low Tide (LW)

The minimum elevation reached by each falling tide (*see* Tide).

2.420 Low Water Datum

An approximation to the plane of mean low water that has been adopted as a standard reference plane (*see* also Chart Datum).

2.421 Low Water Line

The intersection of any standard low tide datum plane with the shore.

2.422 Low Water of Ordinary Spring Tides (LWOST)

A tidal datum based on low water of ordinary spring tides.

2.423 Lower High Water (LHW)

The lower of the two high waters of any tidal day.

2.424 Lower Low Water (LLW)

The lower of the two low waters of any tidal day. The single low water occurring daily during periods when the tide is diurnal is considered to be a lower low water.

2.425 Luffing (Level Luffing)

A modern and widely accepted operation of a crane, in which the jib of the crane is moved inwards and outwards without raising or lowering the load and thus achieving valuable economy in both power and time.

2.426 Major Port

A port providing almost all the facilities required for a standard port and declared by the proper authority of the country as a major port.

2.427 Manifest (Clearance or Entrance for Cargo and Passenger)

A document containing a listing of a commodity items/passengers carried by a vessel. The manifest is one of the requirements for clearance/entrance of vessel.

2.428 Marigram

A graphic record of the tide levels at a particular coastal station.

2.429 Marine Borers

Any mollusc or crustacean that lives usually in warm seas and destroys wood by boring into and eating it. The gribble and shipworm are the best known since they penetrate any wood in favourable water.

2.430 Marshalling Yard

A place where containers are stacked and arranged according to the sequence or withdrawal to consignee or transferred to CY—CFS or CY inside Port/Customs Zone. It is also where the containers are arranged prior to loading to a carrying vessel in accordance with the sequence of loading in the storage plan.

2.431 Mass Transport

The net transfer of water by wave action in the direction of wave travel.

2.432 Mattress

A cushioning and soling layer usually made of bamboo, soft wood, brush wood, or even concrete, etc, provided at the bottom of a river training or bank protection work.

2.433 Mean High Water (MHW)

The average height of the high waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All high water heights are included in the average where the type of tide is either semidiurnal or mixed. Only the higher high water heights are included in the average where the type of tide is diurnal. So determined, mean high water in the latter case is the same as mean higher high water.

2.434 Mean High Water, Neaps (MHWN)

The average height of the high water occurring at the time of neap tides.

2.435 Mean High Water, Springs (MHWS)

The average height of the high water occurring at the time of spring tides. Frequently abbreviated to high water springs.

2.436 Mean Higher High Water (MHHW)

The average height of the higher high waters over a 19 year period. For shorter periods of observation, corrections are applied to eliminate known variations and reduce the result to the equivalent of a mean 19 year value.

2.437 Mean Low Water (MLW)

The average height of the low waters over a 19 year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19 year value. All low water heights are included in the average where the type of tide is either semidiurnal or mixed. Only lower low water heights are included in the average where the type of tide is diurnal. So determined, mean low water in the latter case is the same as mean lower low water.

2.438 Mean Low Water, Neaps (MLWN)

The average height of low waters occurring at the time of neap tides.

2.439 Mean Low Water, Springs (MLWS)

The average height of low waters occurring at the time of spring tides. It is usually derived by taking a plane depressed below the half tide level by an amount equal to one half the spring range of tide, necessary corrections being applied to reduce the results to a mean value. This plane is used to a considerable extent for hydrographic work. Frequently abbreviated as low water springs.

2.440 Mean Lower Low Water (MLLW)

The average height of the lower low waters over a 10 year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the result to the equivalent of a mean 19 year period, Frequently abbreviated as lower low water.

2.441 Mean Sea Level (MSL)

The average height of the sea level for all stages of the tide over a 19-year period, usually determined from hourly height readings.

2.442 Mean Tide Level

A plane midway between mean high water and mean low water. Also called half-tidal level.

2.443 Megaripple

See Sand Wave.

2.444 Metric Ton — The weight measurement equivalent to 2 204.6 lbs or 1 000 kilograms.

2.445 Middle—Ground Shoal

A shoal formed by ebb and flood tides in the middle of the channel of the lagoon or estuary end of an inlet.

2.446 Minimum Duration

See Duration, Minimum.

2.447 Minimum Fetch

The least distance in which steady state wave conditions will develop for a wind of given speed blowing for a given duration of time.

2.448 Minor Port

A port providing a very few facilities required for a standard port and mostly owned by local authorities.

2.449 Mixed Tide

A type of tide in which the presence of a diurnal wave is conspicuous by a large inequality in either

the high or low water heights with two high waters and two low waters usually occurring each tidal day. In strictness, all tides are mixed, but the name is usually applied without definite limits to the tide intermediate to those predominantly semidiurnal and those predominantly diurnal.

2.450 Mole

A mole is a massive structure, usually of stone, used as a pier, breakwater, or a causeway separating two bodies of water.

2.451 Monochromatic Waves

Monochromatic wave refers to a wave with single wavelength and frequency.

2.452 Monolith

A hollow foundation piece of concrete; brickwork, or masonry with a number of open wells passing through it. It is sunk in a manner similar to the cylindrical caisson, the wells being finally filled with concrete to form a solid foundation.

2.453 Mooring

The place in a river, harbour or dock in which a vessel may be moored and also, that to which vessels may be secured.

2.454 Mooring Buoy

See Buoy, Mooring.

2.455 Mooring Dolphin

See Dolphin, Mooring.

2.456 Mound Breakwaters

See Breakwater, Mound.

2.457 Natural Harbour

See Harbour, Natural.

2.458 Nautical Almanac

Astronomical ephemeris containing more or less similar data are prepared and published in advance by seven countries — India, U.K., U.S.A., U.S.S.R., France, Spain and Japan. A nautical almanac is a publication describing the positions of a selection of celestial bodies for the purpose of enabling navigators to use celestial navigation to determine the position of their ship while at sea.

2.459 Navigation

The science of ascertaining the position of ships and directing their course by astronomical observation

and other calculations — the general process involved in operating ship.

2.460 Navigational Aids

For safe and speedy navigation in coastal waters or in restricted channels, various types of aids are necessary, such as lighthouses, beacons, light signals, semaphores, buoys, radar, etc, all of such equipment and accessories constituting navigational aids.

2.461 Navigation Channel

A channel in a river or waterway used by a ship for navigation, having the required depth for the safe movement of the vessel.

2.462 Navigation Tracks

Paths or tracks marked in a river course or waterway along the navigable channel.

2.463 Neap Tide

Either of the two tides that occur at the first or last quarter of the moon when the tide-generating forces of the sun and moon oppose each other and produce the smallest rise and fall in tidal level

2.464 Nearshore (Zone)

In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. It defines the area of nearshore currents.

2.465 Nearshore Circulation

One ocean circulation pattern composed of the nearshore currents and coastal currents.

2.466 Nearshore Current System

The current system caused primarily by wave action in and near the breaker zone, and which consists of four parts. The shoreward mass transport of water, longshore currents, seaward return flow including rip currents, and the longshore movement of the expanding heads or rip currents (*see* also Nearshore Circulation).

2.467 Neck

- a) The narrow band of water flowing seaward through the surf (also Rip).
- b) The narrow strip of land connecting two larger bodies of land as an isthmus.

2.468 Net gang-hours

The total number of hours actually spent by gangs in discharging and loading cargo, excluding the gangs'

idle time. This is computed by obtaining the difference between gross gang hours and idle gang hours.

2.469 Net Registered Tonnage (NRT)

This is derived from gross tonnage by the deduction of space allowed for navigation, machinery, and crew accommodation. The total enclosed space of a vessel expressed in 100 cubic feet to a ton, excluding the following spaces:

- a) Propelling space which includes machinery and boiler spaces, and shaft trunks in crew ships excluding store rooms and cabin;
- b) Master and crew spaces;
- c) Spaces for helm capstan, anchor gears and spaces used for the navigation of the ship, such as chart room, signals and boatswain stores;
- d) Donkey boiler and engine if connected to main pumps;
- e) Water ballast spaces other than the double bottoms;
- f) Sail room which is limited to 2.5 % of the gross tonnage of ships wholly propelled by sails.

Since 1994 when the results of the 1969 International Tonnage Measurement Convention came into force, Net Registered Tonnage (NRT) has been referred to as Net Tonnage (NT).

2.470 Net Service Time

This refers to the vessel working time.

2.471 Net Tonnage

The carrying capacity of vessels as ascertained according to Government regulations and arrived at by measuring the cubic contents of the space intended for revenue earning. Also called net registered tonnage.

2.472 Nip

The cut made by wave in a shoreline of emergence.

2.473 Node

That part of a standing wave where the vertical motion is least and the horizontal velocities are greatest. Nodes are associated with clapotis and with seiche action resulting from wave reflection (*see* also Loop).

2.474 Nodal Zone

An area in which the predominant direction of the longshore transport changes.

2.475 Nose (of Spur)

The top end of a spur projecting into water.

2.476 Nourishment

The process of replenishing a beach. It may be brought about naturally, by longshore transport, or artificially by the deposition of dredged materials.

2.477 Occupation Factor (of Port)

The probable frequency of full cargoes both inwards and outwards in a port within any specified time, on which depends the planning of berths and ancillaries like transit sheds, open space, etc, to be provided. It is the ratio of the number of berths, jetties and moorings occupied in a port within any specified time to the total number of berths, jetties and moorings.

2.478 Oceanography

The study of the sea, embracing and indicating all knowledge pertaining to the sea's physical boundaries, the chemistry and physics of sea water and marine biology.

2.479 Offshore

- a) In beach terminology, the comparatively flat zone of variable width, extending from the breaker zone to the seaward edge of the continental shelf.
- b) A direction seaward from the shore.

2.480 Offshore Barrier

See Barrier Beach.

2.481 Offshore Current

- a) Any current in the offshore zone.
- b) Any current flowing away from the shore.

2.482 Offshore Mooring

A mooring located away from the shore where a vessel awaiting berthing is moored, or from where loading and unloading of cargoes are done by means of lighters, barges, etc.

2.483 Offshore Terminal

A terminal for berthing a vessel located away from the shore, generally for oil tankers with deep drafts, wherefrom the cargo is transported to the main land by means of pipelines or lighters, etc.

2.484 Oil Terminal

An oil terminal (also called a tank farm, tankfarm, oil installation or oil depot) is an industrial facility for the storage of oil, petroleum and petrochemical products, and from which these products are transported to end users or other storage facilities.

2.485 Openwork and Island Harbour

A harbour formed in deep water out of the range of littoral drift and connected with the shore by means of openwork jetties to avoid the problem of accretion and erosion at solid protective structures provided for a harbour at the shore.

2.486 Opposing Wind

In wave forecasting, a wind blowing in a direction opposite to the ocean wave advance; generally same as headwind.

2.487 Orbit

In water waves, the path of a water particle affected by the wave motion. In deep-water waves, the orbit is nearly circular and in shallow-water waves the orbit is nearly elliptical. In general, the orbits are slightly open in the direction of wave motion giving rise to mass transport.

2.488 Orbital Current

The flow of water accompanying the orbital movement of the water particles in a wave, which is not to be confused with wave-generated littoral currents.

2.489 Orthogonal

On a wave-refraction diagram, a line drawn perpendicularly to the wave crests.

2.490 Oscillatory Wave

A wave in which each individual particle oscillates about a point with little or no permanent change in mean position. The term is commonly applied to

progressive oscillatory waves in which only the form advances, the individual particles moving in closed or nearly closed orbits (*see* also Orbit).

2.491 Overlapping Tide

A tide which engulfs the previously generated tide before the former's time period is over, which is a sort of superimposing of one tide over the other.

2.492 Overtopping

Passing of water over the top of a structure as a result of wave run up or surge action.

2.493 Overwash

Overwash is the flow of water and sediment over a coastal dune or beach crest during storm events.

2.494 Packing or Stuffing

Loading of cargoes inside a container.

2.495 Pallet

A shallow square or rectangular box strongly constructed of wood, usually with two open ends and with the top and bottom formed of open boarding separated by three or more stringers, according to the size of the pallet, used for handling general cargo. This in combination with forklift trucks is useful in handling cargo of a more or less homogeneous character.

2.496 Perched Beach

A beach or fillet of sand retained above the otherwise normal profile level by a submerged dyke.

2.497 Periodic Current

See Current, Periodic.

2.498 Period, Tidal

See Tidal Period.

2.499 Period, Wave

See Wave Period.

2.500 Permanent Current

Set Current, Permanent.

2.501 Permanent Dunnage

Strips of timber fixed to the frames of a ship to keep cargo away from the sides of the ship to avoid damage and condensation.

2.502 Permeable Groin

A groin with openings large enough to permit passage of appreciable quantities of sediment-laden water or littoral drift.

2.503 Pharology

The science of light house construction, the name derived from the lighthouse or tower built at the island of Pharos in Alexandria by about 270 B.C.

2.504 Phase Velocity

Propagation velocity of an individual wave as opposed to the velocity of a wave group.

2.505 Pier

A structure, usually of open construction, extending out into the harbour with sufficient depth from the shore, to serve as a landing place, a recreational facility, etc, rather than to afford coastal protection.

2.506 Pier Apron

The apron or open paved area adjacent to a pier.

2.507 Pier Head

The termination of a breakwater, mole or training work extending into water from the shore, which is generally wider than the main body of the structure, with a definite geometrical shape, like circular, octagonal, hammerhead, etc, as convenient. This part of the structure is open on three sides.

2.508 Pilot Vessel (also Pilot Boat)

A steam, motor or sailing vessel of small dimensions specially built and equipped for dropping or picking up pilots who serve the large deep-water vessels entering or leaving port.

2.509 Pitching

A method of bank/shore protection work in which one or more layers of rubble stone, granite, concrete blocks or brickwork are provided on the bank generally in the natural slope of the bank or embankment and above low water level.

2.510 Pitching (of Ship)

The angular motion which a ship makes about a transverse axis through her centre of gravity in a seaway due to wave action, wind, tidal action, etc, for which sufficient clearance must be allowed below its keel in a shallow channel.

2.511 Planform

The outline or shape of a body of water as determined by the still water line.

2.512 Plunge Point

- a) For a plunging wave, the point at which the wave curls over and falls.
- b) The final breaking point of the waves just before they rush up on.

2.513 Plunging Breaker

Set Breaker.

2.514 Pneumatic Breakwater

See Breakwater, Pneumatic.

2.515 Pneumatic Tide Recorder

An automatic tide recording machine consisting of an airtube of about 6 mm internal diameter connected to a small air chamber fixed below low water level and at the other end to the recording apparatus. Air is supplied by means of a cylinder of compressed air or a small compressor, and slowly escapes from the chamber; the varying pressure in the tube due to the height of water is a measure of the rise and fall of tide which is recorded by pressure gauge.

2.516 Pocket Beach

A beach, usually small, in a coastal re-entrant or between two littoral barriers.

2.517 Point of Reversal (Tide)

The point of time at which the direction of current changes from flood to ebb or vice versa.

2.518 Port

A terminus of great ocean trunk lines of communication; a place where vessels may discharge or receive cargo; may be the commercial part of a harbour where the quays, wharves, jetties facilities for transfer of cargo, docks and repair shops are situated, or may be the entire harbour including its approaches and anchorages.

2.519 Portal Crane

See Crane, Portal.

2.520 Port Anchorage

An anchorage often provided in a port for shipping before proceeding to a dock or quay for such purposes as customs and quarantine inspection, the discharge of explosives (and on the outward voyage for loading such material) and in time of war for defensive purposes.

2.521 Port Dues

Charge against vessel engaged in foreign trade, including those engaged in barter trade, that enter any port whether private or government on each bases in gross registered tonnage (GRT) of the vessel.

2.522 Port of Origin

The last port of call.

2.523 Port, Major

See Major Port,

2.524 Port, Minor

See Minor Port.

2.525 Ports, Intermediate

See Intermediate Port.

2.526 Potential Energy (of Wave)

In a progressive oscillatory wave, the energy resulting from the elevation or depression of the water surface from the undisturbed level.

2.527 Prediction of Tide

Prediction of tidal time and heights and ranges at a location for the future, depending upon the past observations of the tides for a 19 year period (a saros), or if the records be available for a shorter period, by applying required corrections by a system of harmonic analysis generally done by means of tide-predicting machines.

2.528 Prism, Tidal

See Tidal Prism.

2.529 Probable Maximum Water Level

A hypothetical water level (exclusive of wave run up from normal wind generated waves) that might result from the most severe combination of hydrometeorological, geoseismic and other geophysical factors that is considered reasonably possible in the region involved, with each of these factors considered as affecting the locality in a maximum manner. This level represents the physical response of a body of water to maximum applied phenomena, such as hurricanes, moving squall lines, other cyclonic meteorological events, tsunamis and astronomical tide combined with maximum probable hydrological conditions. It is a water level with virtually no risk of being exceeded.

2.530 Profile, Beach

The intersection of the ground surface with a vertical plane; may extend from the top of the dune line to the seaward limit of sand movement.

2.531 Progression (of a Beach)

See Advance.

2.532 Progressive Wave

A wave that moves relative to a fixed Coordinate system in a fluid. The direction in which it moves is termed the direction of wave propagation.

2.533 Protected Harbour

See Harbour, Protected.

2.534 Quay

A stretch of paved bank, or a solid artificial landing place parallel to the navigable waterway, for use in loading and unloading vessels.

2.535 Quay Crane

Same as Crane, Wharf.

2.536 Quick Release Mooring Hook (QRMH)

Fixed to the Berthing and Mooring Dolphins, consisting of a set of 2 or 3 hook configuration, to hold the ropes from the Vessel. This is provided with an electrically operated capstan to pull the ropes from the vessel.

2.537 Quay walls

The basic physical infrastructure provided to berth ship.

2.538 Radius of Maximum Winds

Distance from the eye of a hurricane where surface and wind velocities are zero to the place where surface wind speeds are maximum.

2.539 Rail and Water Terminal

A terminal for loading and unloading of cargoes to and from vessels, where railway terminus also is provided for quick transport of the cargo.

2.540 Rail Road Wharf

A wharf with rail and roadways provided on the wharf structure for quick transport of cargo.

2.541 Range of Tide

The difference in height between consecutive high water and low water (or higher high and lower low waters).

2.542 Ray, Wave

See Orthogonal.

2.543 Reach

A straight course between the bends of a river. A straight part in a navigable river.

2.544 Recession (of a Beach) (also Retrogression)

- a) A continuing landward movement of the shoreline.
- b) A net landward movement of the shoreline over a specified time.

2.545 Recirculation System (in Docks)

The system of recirculation of water by pumps in an impounded dock to maintain the required level of water in the dock.

2.546 Reaf, Sand

Synonymous with bar.

2.547 Reflected Wave

That part on an incident wave that is returned back when a wave impinges on a steep beach, barrier, or other reflecting surface.

2.548 Reflection (of a Wave)

The returning back of a part of or a full incident wave on meeting a steep beach, barrier, a vertical wall or other reflecting surface, that is, the momentum of the incident wave is arrested and some of the wave energy is absorbed at the reflecting surface and some is returned back with the reflected wave. This reflected part on meeting another advancing wave gives rise to standing wave, clapotis, etc.

2.549 Refraction Coefficient

The square root of the ratio of the spacing between adjacent orthogonals in deep water and in shallow water at a selected point. When multiplied by the shoaling factor and a factor for friction and percolation, this becomes the wave height coefficient or the ratio of the refracted wave height at any point to the deepwater wave height. Also the square root of the energy coefficient.

2.550 Refraction Diagram

A drawing showing position of wave crests and/or orthogonals in a given area for a specific deep water wave period and direction.

2.551 Refraction (of a Wave)

- a) The process by which the direction of a wave moving in shallow water at an angle to the contours is changed. The part of the wave advancing in shallower water moves more slowly than that part still advancing in deeper water, causing the wave crest to bend toward alignment with the underwater contours.
- b) The bending of wave crests by currents.

2.552 Resonance

The phenomenon of amplification of a free wave or oscillation of a system by a forced wave or oscillation of exactly equal period. The forced wave may arise from an impressed force upon the system or from a boundary condition. In case of an enclosed harbour, when the natural frequency of the harbour coincides with the frequency of an outside disturbance like a storm wave, the disturbance within the harbour is much more amplified and may cause disaster to ships and structures within the harbour, when it is called harbour resonance.

2.553 Retardation (also Daily Retardation)

The amount of time by which corresponding tidal phases grow later day by day (about 50 minutes).

2.554 Retrogression (of a Beach)

See Recession.

2.555 Ridge, Beach

See Beach Ridge.

2.556 Rill Marks

Tiny drainage channels in a beach, caused by the flow seaward of water, left in the sands of the upper part of the beach after the retreat of the tide or after dying down of storm waves.

2.557 Rip

A body of water made rough by waves meeting an opposing current, particularly a tidal current; often formed where tidal currents are converging and sinking.

2.558 Rip Current

See Current, Rip.

2.559 Rip Surf

See Current, Rip.

2.560 Riparian

Pertaining to the banks of a body of water.

2.561 River Training

The process of regulating a river for improvement of navigable and/or hydraulic conditions by deepening the flow channel or confining a shifting, unstable or diverging flow to a single channel at one site by structures like spurs, groynes, etc, encroaching a part of the waterway, and/or dredging, embankment, etc.

2.562 Roadstead A sheltered area of water near shore where vessels may anchor in relative safety shore.

2.563 Rock Breakers

Employed in dredging operation in rock beds for breaking up of hard masses of rock into small fragments so that the material may be removed either by multibucket dredger, dipper or grab dredger, and also where blasting operations are impracticable. The breaker is usually in rectangular pontoon form, self propelled or dummy, very similar to a pile barge in its equipment, having a tripod derrick with winches for hoisting long pointed steel rams which are allowed to fall freely, and by succession of blows pierce the rock, compressed air or steam-operated hammers being also used in modern crafts. Some modern type of rock breakers combine dredging facilities with rock breaking.

2.564 Roller

An indefinite term, sometimes considered to denote one of a series of long crested, large waves which roll in on a shore, as after a storm.

2.565 Rolling Caisson

See Caisson, Rolling.

2.566 Rolling of Ship

The transverse oscillating rotation of a vessel about a longitudinal axis, which results when it meets waves with crests approximately parallel to the length of the ship and which offers resistance to its propulsion.

2.567 Roll-On Roll-Off Vessels

Vessels through which vehicles can be driven.

2.568 Rose, Wind

See Wind Rose.

2.569 Rubble

- a) Loose angular waterworn stones along a beach.
- b) Rough, irregular fragments of broken rock.

2.570 Rubble Mound Breakwater

See Breakwater, Mound.

2.571 Rubble Mound Structure

A mound of random shaped and random placed stones protected with a cover layer of selected stones or specially shaped concrete armour units, usually used for marine works to withstand wave action.

2.572 Runnel

A corrugation, or trough formed in the foreshore or in the bottom just offshore by waves or tidal currents.

2.573 Runup (also Uprush)

The rush of water up a structure or beach on the breaking of a wave. The amount of run up is the vertical height above still water level that the rush of water reaches.

2.574 Saltation

The method of sand movement in a fluid in which individual particles leave the bed by bounding nearly vertically and, because the motion of the fluid is not strong or turbulent enough to retain them in suspension, return to the bed at some distance. The travel path of the particles is a series of hops and bounds.

2.575 Sand Bar

- a) *See* Bar.
- b) In a river, a ridge of sand built up to or near the surface by river currents.

2.576 Sand Bypassing

See Bypassing, Sand.

2.577 Sand-Pump Dredger

A dredger in which the material to be dredged is pumped up through a pipe by a centrifugal pump either direct or after previous mechanical erosion or disintegration and delivered into hoppers with a large quantity of water for settling. Such dredgers were originally designed to deal with sand only, but later modifications and improvements have enabled them to be used for other materials also. Entrance channels to harbours with heavy littoral deposits are sometimes kept free by means of sand pump dredger which pumps the sand from the accreting side of the entrance to the eroding side.

2.578 Sand Reef

Synonymous with bar.

2.579 Sand Wave (Megaripple)

A large wave like sediment feature composed of sand in very shallow water. Wave length may reach 100 m; amplitude is about 0.5 m.

2.580 Scrap, Beach

See Beach Scrap.

2.581 Scraping and Scuttling

Method of maintaining a fairway having tendency to silt up. The method consists of stirring the deposit by mechanical means, to enable it to be carried away by an existing outward current. Harrows are employed for the purpose, aided by high pressure water jets worked from a small tug during the ebb tide. The same method with a larger vessel has been employed for removing sandy bars at the mouths of rivers.

2.582 Screw Moorings

Screw piles of steel usually of large diameter (of the order of 1.2 m) used for mooring of vessels with the help of chains and mooring buoys.

2.583 Sea Cliff

A cliff situated at the seaward edge of the coast.

2.584 Sea Level

See Mean Sea Level.

2.585 Sea Mount

An elevation rising more than 1 000 metres above the ocean floor, and of limited extent across the summit.

2.586 Sea Puss

A dangerous longshore current, a rip current caused by return flow; loosely, the submerged channel or inlet through a bar caused by those currents.

2.587 Sea Wall

A structure separating land and water areas, primarily designed to prevent erosion and other damages due to wave action (*see* also).

2.588 Sea Way

A navigable portion of the sea.

2.589 Sector Gate

See Gate, Sector.

2.590 Seiche

- a) A standing wave oscillation of an enclosed water body that continues, pendulum fashion, after the cessation of the originating force, which may have been either seismic or atmospheric.
- b) An oscillation of a fluid body in response to a disturbing force having the same frequency as the natural frequency of the fluid system. Tides are now considered to be seiches induced primarily by the sun and moon.

2.591 Seismic Sea Wave (Tsunami)

A long period wave caused by an underwater seismic disturbance or volcanic eruption. Commonly misnamed 'tidal wave'.

2.592 Semaphore, Tidal

A navigational aid indicating the rise of tide at different stages of tide in a tidal river. The rises are indicated by a set of symbols (lights during night) on a tall structure constructed on the shore.

2.593 Semi-Diurnal Tide

A tide with two high and two low waters in a tidal day with comparatively little diurnal inequality.

2.594 Set of Current

The direction toward which a current flows.

2.595 Set Up, Wave

Super elevation of the water surface over normal surge elevation due to onshore mass transport of the water by wave action along.

2.596 Set Up, Wind

See Wind set up.

2.597 Shallow Water

- a) Commonly, water of such a depth that surface waves are noticeably affected by bottom topography. It is customary to consider water of depths less than one half the surface wavelength as shallow water.
- b) More strictly, in hydrodynamics with regard to progressive gravity waves, water in which the depth is less than $1/25$ the wavelength.

2.598 Shear Legs (also Sheer-Legs, Sheers)

A large lifting device used in shipyards etc, resembling a crane in which a pair of inclined struts take the place of a jib.

2.599 Shelf, Continental

See Continental Shelf.

2.600 Shelf, Insular *See* Insular Shelf.**2.601 Ship Channel**

A channel in a waterway used for navigation.

2.602 Ship Worm

See Teredo Navals.

2.603 Shipcalls

The number of vessels which call or arrive at a particular port at any given time.

2.604 Shoal

A detached elevation of the sea bottom or river bed, comprised of any material except rock or coral, which may endanger surface navigation.

2.605 Shoaling Coefficient

The ratio of the height of a wave in water of any depth to its height in deep water with the effects of refraction, friction and percolation eliminated. Sometimes termed as shoaling factor or depth factor.

2.606 Shoreface

The narrow zone seaward from the low tide shoreline covered by water over which the beach sands and gravels activity oscillate with changing wave conditions.

2.607 Significant Wave

A statistical term relating to the one-third highest waves of a given wave group and defined by the average of their heights and periods. The composition of the higher waves depends upon the extent to which the lower waves are considered.

2.608 Significant Wave Height (also Characteristic Wave-Height)

The average height of the one-third highest waves of a given wave group. In wave record analysis, the average height of the highest one-third of a selected number of waves, this number being determined by dividing the time of record by the significant period.

2.609 Significant Wave Period

An arbitrary period generally taken as the period of the one-third highest waves within a wave group. In

wave record analysis, this is determined as the average period of the most frequently recurring of the larger well-defined waves in the record under study.

2.610 Sill

See Dock sill.

2.611 Slack Tide (Slack Water)

The state of a tidal current when its velocity is near zero, especially the movement when a reversing current changes direction and its velocity is zero. Sometimes considered the intermediate period between ebb and flood currents during which the velocity of the currents is less than 0.2 km/h (*see* Stand of Tide).

2.612 Sliding Caisson

See Caisson, Sliding.

2.613 Slip

A berthing space between two piers.

2.614 Slip Dock

A repairing dock in which the vessel is partially withdrawn from the water by means of ways, the remaining water being removed by natural or artificial means, for repair to the hull and keel of the vessel.

2.615 Slipway

A sloping platform used for hauling up and repairing of vessels, usually of smaller capacity than those repaired in dry docks.

2.616 Slough

See Bayou.

2.617 Sluices, Gate

Sluices provided in a lock or dry dock for levelling water on both sides of a pair of lock gates preparatory to opening them. May be fitted in the gates themselves or located in the side walls.

2.618 Solitary Wave

A wave consisting of a single elevation (above the original water surface), its height not necessarily small compared to the depth, and neither followed nor preceded by another elevation or depression of the water surface.

2.619 Sound

- a) A wide waterway between the mainland and an island, or a wide waterway connecting two sea areas (*see* also Strait).
- b) A relatively long arm of the sea or ocean forming a channel between an island and a mainland or connecting two larger bodies, as a sea and the ocean, or two parts of the same body; usually wider and more extensive than a strait.

2.620 Sounding

A measured depth of water. On hydrographic charts the soundings are adjusted to a specified plane of reference.

2.621 Sounding Datum

The plane to which soundings are referred (*see* also Chart Datum).

2.622 Spacing Factor

It is an arbitrary rate (expressed in percent) which is being used to indicate the spacing between vessels when at berth. The normal factor is ten percent of LOA.

2.623 Spending Beach

See Beach, Spending.

2.624 Spilling Breaker

See Breaker.

2.625 Spit

A small point of land or a narrow shoal projecting into a body of water from the shore.

2.626 Spring Tide

A tide that occurs at or near the time of new or full moon (syzygy), and which rises highest and falls lowest from the mean sea level.

2.627 Spur

A permeable or impermeable structure constructed from the bank in a river, estuary or any waterway, built usually perpendicular to the shore line or at a small angle from the perpendicular, for river training and bank protection works.

2.628 Squatting (of a Ship)

The tendency of a vessel to settle down in shallow water as she moves through it, for which sufficient clearance depending upon the speed of the vessel must be allowed between the keel of the vessel and the bed of the waterway.

2.629 Staith

Used for loading of coal/ore into vessel and worked on principle of gravity. It is a jetty on to which the coal/ore wagons gravitate and discharge their loads into hopper from which the coal/ore runs on to a short belt conveyor or down a spout or chute into the vessel.

2.630 Standard Project Hurricane

See Hypothetical Hurricane.

2.631 Standing Wave

A type of wave in which the surface of the water oscillates vertically between fixed points, called nodes, without progression. The points of maximum vertical rise and fall are called antinodes or loops where the underlying water particles have no horizontal motion but maximum vertical motion while at nodes these have no vertical motion but maximum horizontal motion. This may be the result of two equal progressive wave trains travelling through each other in opposite directions. Sometimes called cleptis or stationary wave.

2.632 Stand of Tide

An interval at high or low water when there is no sensible change in the height of the tide. The water level is stationary at high and low water for only an instant, but the change in level near these times is so slow that it is not usually perceptible (*see* Slack Tide).

2.633 Stationary Wave

A wave of essentially stable form which does not move with respect to a selected reference point; a fixed swelling. Sometimes called standing wave.

2.634 Stern

The after-part of a ship or boat.

2.635 Stevedore

Person who provides cargo handling service. In the Philippines, the term refers to a person of company engaged in cargo handling on-board a vessel as opposed to arrastre.

2.636 Stevedoring Services

All works performed on board vessel, that is, the process or act of loading and unloading cargo, stowing inside hatches, compartments and on deck or open spaces on board vessel.

2.637 Still Water Level

The elevation that the surface of the water would assume if all wave action were absent.

2.638 Stockpile

Sand piled on a beach foreshore to nourish downdrift beaches by natural littoral currents or forces (*see* Feeder Beach).

2.639 Stone Pitching

See Pitching.

2.640 Storm

A wind of intensity less than a hurricane but higher than a gale, occupying No. 11 position in Beaufort scale of wind forces with an average velocity between 103 to 117 km/h.

2.641 Storm Gate

See Gate, Storm.

2.642 Storm Surge

A rise above normal water level on the open coast due to the action of wind stress on the water surface. Storm surge resulting from a hurricane also includes that rise in level due to atmospheric pressure reduction as well as that due to wind stress (*see* Wind Set Up).

2.643 Storm Tide

See Storm Surge.

2.644 Strait

A relatively narrow waterway between two larger bodies of water (*see* also Sound).

2.645 Stripping

Unloading goods from a container.

2.646 Suction Dredger

See Dredger, Suction.

2.647 Surf

The wave activity in the area between the shoreline and the outermost limit of breakers.

2.648 Surf Beat

Irregular oscillations of the nearshore water level, with periods of the order of several minutes.

2.649 Surf Zone

The area between the outermost breaker and the limit of wave uprush.

2.650 Surge

- a) The name applied to wave motion with a period intermediate between that of the ordinary wind wave and that of the tide. It is of low height, usually less than 0.1 m (*see also Seiche*).
- b) In fluid flow, long interval variations in velocity and pressure, not necessarily periodic, perhaps even transient in nature.
- c) *See Storm Surge*.

2.651 Surging Breaker

See Breaker.

2.652 Suspended Fender

See Fender, Suspended.

2.653 Suspended Load

- a) The material moving in suspension in a fluid, being kept up by the upward components of the turbulent currents or by colloidal suspension.
- b) The material collected in or computed from samples collected with a suspended load sampler.

2.654 Swale

The depression between two beach ridges.

2.655 Swash (also Uprush, Runup)

The rush of water up onto the beach face following the breaking of a wave.

2.656 Swash Channel

- a) On the open shore, a channel cut by flowing water in its return to the parent body, for example, a rip channel.
- b) A secondary channel passing through or shoreward of an inlet or river bar.

2.657 Swash Mark

The thin wavy line of fine sand, mica scales, bits of seaweed, etc, left by the uprush when it recedes from its upward limit of movement on the beach face.

2.658 Swell

Wind generated waves that have travelled out of their generating area. Swell characteristically exhibits a more regular and longer period, and has flatter crests than waves within their fetch (Seas).

2.659 Swinging Caisson

See Caisson, Swinging.

2.660 Synoptic Chart

A chart showing the distribution of meteorological conditions over a given area at a given time. Popularly called a weather map.

2.661 Syzygy

The two points on the moon's orbit when the moon is in conjunction or opposition to the sun relative to the earth; time of new or full moon in the cycle of phases when or nearly when spring tides occur.

2.662 Tainter Gate

See Sector Gate.

2.663 Teredo Navals (Shipworm)

A burrowing lamelli-branch mollusc causing damage to timber structures used in marine work. The burrow of the teredo enters the surface of the wood generally at right angles to the grain and then curves upward or downward and follows the grain of the wood. The attacks extend down below high water mark to almost any depth.

2.664 Terminal Management Office (TMO)

Refers to an administrative unit overseeing the operation of a terminal in delivering frontline services.

2.665 Tetrapod

A patented form of concrete block consisting of four legs disposed in triangular form so that when three points are resting on the ground the fourth leg is vertical. This shape possesses excellent interlocking qualities and provides high roughness as well as permeability effecting a very great degree of dissipation of wave energy. This is extensively used for revetting the exposed faces of rubble mound breakwaters and beach protection works.

2.666 Thalweg

In hydraulics, the line joining the deepest points of an inlet or stream channel.

2.667 Tidal Basin

See Basin, Tidal.

2.668 Tidal Current

See Current, Tidal.

2.669 Tidal Datum

See Chart Datum.

2.670 Tidal Day

The time of the rotation of the earth with respect to the moon, or the interval between two successive upper transits of the moon over the meridian of a place, approximately 24.84 solar hours or 1.035 times the mean solar day. Also called lunar day.

2.671 Tidal Flats

Marshy or muddy land areas which are covered and uncovered by the rise and fall of the tide.

2.672 Tidal Flow

Oscillating flow of water due to tidal action.

2.673 Tidal Inlet

A natural inlet maintained by tidal flow.

2.674 Tidal Levels

The levels attained by water in a tidal area during different stages of tide, like high water, low water, etc.

2.675 Tidal Period

The interval of time between two consecutive like phases of the tide.

2.676 Tidal Pool

A pool of water remaining on a beach or reef or bank after recession of the tide.

2.677 Tidal Prism

The total amount of water that flows into a harbour or estuary and out again with movement of the tide, excluding any fresh water flow.

2.678 Tidal Range

See Range of Tide.

2.679 Tidal Rise

The height of tide as referred to the datum of a chart.

2.680 Tidal River

A waterway connecting the sea or estuary at the downstream end and a fluvial river at the upstream end where tide plays.

2.681 Tidal Wave

- a) The wave motion of the tides.

- b) In popular usage, any unusually high and destructive water level along a shore. It normally refers to storm surges or tsunamis.

2.682 Tide

The periodic rising and falling of the water that results from gravitational attraction primarily of the moon and sun, acting upon the rotating earth. Although the accompanying horizontal movement of the water resulting from the same cause is also sometimes called the tide, it is preferable to designate the latter as Tidal Current reserving the name tide for the vertical movement.

2.683 Tide, Daily Retardation of

See Daily Retardation of Tides.

2.684 Tide, Diurnal

See Diurnal Tide.

2.685 Tide, Ebb

See Ebb Tide.

2.686 Tide, Flood

See Flood Tide.

2.687 Tide Gauge

An appliance used for indicating changes in the water surface level during different stages of tide. In the simplest form it consists of an upright stake or post driven into the shore, bank, or bed and graduated to linear measure.

2.688 Tide, Mixed

See Mixed Tide.

2.689 Tide, Neap

See Neap Tide.

2.690 Tide, Prediction

See Prediction of Tide.

2.691 Tide, Semi-diurnal

See Semi-diurnal Tide.

2.692 Tide, Slack

See Slack Tide.

2.693 Tide, Spring

See Spring Tide.

2.694 Tide Station

A place at which tide observations are being taken. It is called a primary tide station when continuous observations are to be taken over a number of years to obtain basic tidal data for the locality. A secondary tide station is one operated over a short period of time to obtain data for a specific purpose.

2.695 Tide, Storm

See Storm Tide.

2.696 Tide Table

A table giving the predicted daily heights and times of the tide for a specific period at one or more stations in a locality.

2.697 Time on Berth

This is also described as the service time. It is the number of hours a vessel spent from the time of completing the berthing process to the time of completion of the un-berthing process on final departure. It may include the downtime/ idle time of the vessel while on berth.

2.698 Tombolo

A bar or spit that connects or 'ties' an island to the mainland or to another island.

2.699 Track Marks

Artificial marks on shore or in water showing the alignment of navigation route in a waterway.

2.700 Track, Navigation

See Navigation Tracks.

2.701 Training Wall

A wall or jetty to direct current flow.

2.702 Training Work

See River Training.

2.703 Transit Cargo

Cargo discharged and loaded from a port of origin to a port of destination through another port.

2.704 Transit Marks

Prominent objects or structures on a coastline or river bank, which act as a means of alignment or as an indication of change of direction in a navigating channel.

2.705 Transit Shed

A shed provided at a cargo berth for temporary accommodation and protection from weather of cargoes deposited on dock quay or of freights on the eve of shipment. A transit shed may be single or more storied according to the requirements and the covered area depends upon the quantum and types of cargo handled at the berth.

2.706 Transitional Zone (Transitional Water)

In regard to progressive gravity waves, water whose depth is less than $1/2$ but more than $1/25$ the wavelength. Often called Shallow Water.

2.707 Translatory Wave

See Wave of Translation.

2.708 Transporter

An appliance for cargo handling consisting of a long arm or track, placed horizontally or very nearly so, along which travels a carriage with a hook for the attachment of loads.

2.709 Transposed Hurricane

See Hypothetical Hurricane.

2.710 Transshipment

The shipment of goods or containers to an intermediate country of destination then to yet another country of final destination. The port intermediate country is referred to as transshipment port.

2.711 Traversing Caisson

See Caisson, Traversing.

2.712 Trochoidal Wave

A progressive oscillatory wave whose form is that of a prolate cycloid or trochoid; it is approximated by waves of small amplitude.

2.713 Tropical Cyclone

See Hurricane.

2.714 Tropical Storm

A tropical cyclone with maximum winds less than 34 km/h.

2.715 Trough of Wave

The lowest part of a wave form between successive crests. Also that part of a wave below still water level.

2.716 Tsunami

See Seismic sea wave.

2.717 Tug

A small vessel of adequate power and a high degree of seaworthiness used primarily to drag a craft or to render the necessary assistance to ocean going vessels in docking and undocking, berthing in the docks and at jetties, etc, and in navigating and manoeuvring in narrow and congested waters. The type and power of a tug will be determined by the duties required for it.

2.718 Turnround (of Vessels)

The whole series of operations connected with the arrival and departure of a vessel, including the discharge of its cargo and the process of reloading.

2.719 Turning Basin

See Basin, Turning.

2.720 Typhoon

See Hurricane.

2.721 Undertow

A current, below water surface, flowing seaward; also the receding water below the surface from waves breaking on a shelving beach. Often a misnomer for rip current.

2.722 Universal Buoyage System

A uniform system of buoyage in regard to colours, shape and sizes of buoys used for navigational aids adopted over all the ports of the world as per international agreement of 1936.

2.723 Unmanned Light Vessel

Small light vessel varying in length and fully decked over and equipped with light and sound signals suitably divided into compartments to provide some measure of safety in case of damage by collision (*see* also Light Vessel).

2.724 Upcoast

The coastal direction generally tending toward the north.

2.725 Updrift

The direction opposite that of the predominant movement of littoral materials or bed materials.

2.726 Upland

The land area in the upstream direction of a river or channel section.

2.727 Upland Discharge

The discharge through a river or channel section coming from the upland area.

2.728 Uprush (also Swash, Runup)

The rush of water up onto the beach following the breaking of a wave.

2.729 Upstream

Opposite to the direction in which the river normally flows. For tidal rivers, it is the direction of flood flow.

2.730 Variability of Waves

- a) The variation of heights and periods between individual waves within a wave train.
- b) The variation in direction of propagation of waves leaving the generating area.
- c) The variation in height along the crest, usually called 'variation along the wave'.

2.731 Velocity of Waves

The speed at which an individual wave advances.

2.732 Vertical Exaggeration (in Models)

The ratio of the horizontal scale to the vertical scale used in a hydraulic model.

2.733 Vertical Lift Gate

See Gate, Vertical Lift.

2.734 Vertical Wall Breakwater

See Breakwater, Vertical Wall.

2.735 Vessel

Includes any ship or boat or any description of a vessel or boat, or any artificial contrivance used or capable of being used as a means of transportation on water.

2.736 Waiting Time

The number of hours spent by a vessel from the time of first reporting at the port to the time of completion of the berthing process before working.

2.737 Wall Breakwater

See Breakwater, Vertical Wall.

2.738 Warehouse

Accommodation provided in the dock area or in the near vicinity for the reception of discharged cargoes or goods for shipment, which are to be stored for periods of longer and perhaps indefinite duration. Bonded warehouses, where dutiable goods are stored, are of special help to importers.

2.739 Water Line

A juncture of land and water or sea. This line migrates, changing with the tide or other fluctuation in the water level. Where waves are present on the beach, this line is also known as the limit of backrush.

2.740 Wave Age

The ratio of wave speed to wind speed.

2.741 Wave Amplitude

See Amplitude (of Wave).

2.742 Wave, Capillary

See Capillary Wave.

2.743 Wave, Cnoidal

See Cnoidal Wave.

2.744 Wave, Crest

See Crest of Wave.

2.745 Wave, Crest Length

See Crest Length, Wave.

2.746 Wave Cycloidal

See Cycloidal Wave.

2.747 Wave Decay

See Decay of Waves.

2.748 Wave Deflection

See Deflection (of Wave).

2.749 Wave Diffraction

See Diffraction (of Water Waves).

2.750 Wave Direction

The direction from which a wave approaches.

2.751 Wave Forecasting

The theoretical determination of future wave characteristics, usually from observed or predicted meteorological phenomena.

2.752 Wave Generation

See Generation of Wave.

2.753 Wave, Gravity

See Gravity Wave.

2.754 Wave Group

A series of waves in which the wave direction, wave length, and wave height vary only slightly (*see* also Group Velocity).

2.755 Wave Height

The vertical distance between a crest and the preceeding trough (*see* also Significant Wave Height).

2.756 Wave Height Coefficient

The ratio of the wave height at a selected point to the deepwater wave height. The refraction coefficient multiplied by the shoaling factor.

2.757 Wave Hindcasting

See Hindcasting, Wave.

2.758 Wave, Irrotational

See Irrotational Wave.

2.759 Wave, Length

See Length of Wave.

2.760 Waves, Monochromatic

See Monochromatic Waves.

2.761 Wave, Oscillatory

See Oscillatory Wave.

2.762 Wave Period

The time for a wave crest to traverse a distance equal to one wave length. The time for two successive wave crests to pass a fixed point (*see* also Significant Wave Period).

2.763 Wave Pressure

Pressure exerted by a wave on a structure obstructing the path of wave motion. It is composed of an impact pressure and a static pressure.

2.764 Wave, Progressive

See Progressive Wave.

2.765 Wave Ray

See Orthogonal.

2.766 Wave, Reflected

See Reflected Wave.

2.767 Wave Refraction

See Refraction (of a Wave),

2.768 Wave Runup

See Runup.

2.769 Wave Set up

See Set up, Wave.

2.770 Wave, Significant

See Significant Wave.

2.771 Wave, Solitary

See Solitary Wave.

2.772 Wave, Standing

See Standing Wave.

2.773 Wave, Stationary

See Stationary Wave.

2.774 Wave Steepness

The ratio of the wave height to the wave length.

2.775 Wave Train

A series of waves from the same direction.

2.776 Wave of Translation

A wave in which the water particles are permanently displaced to a significant degree in the direction of wave travel. Distinguished from Oscillatory Wave.

2.777 Wave, Trochoidal

See Trochoidal Wave.

2.778 Wave Trough

See Trough of Wave.

2.779 Wave Variability

See Variability of Waves.

2.780 Wave Velocity

See Velocity of Waves.

2.781 Wave, Wind

See Wind Waves.

2.782 Waves, Internal

See Internal Waves.

2.783 Weir Jetty

An updrift jetty with a low section or weir over which littoral drift or sediment moves into a predredged deposition basin which is dredged periodically.

2.784 Wet Dock

See Dock, Wet.

2.785 Wharf

A continuous structure built parallel to the margin of the sea or alongside riverbanks, canals, or waterways where vessels may lie alongside to receive or discharge cargo, embark or disembark passengers, or lie at rest.

2.786 Wharf Apron

See Apron.

2.787 Winch

A mechanical gear used for hauling or hoisting other bodies by the winding of rope on a drum.

2.788 Wind Chop

See Chop.

2.789 Wind, Following

See Following Wind.

2.790 Wind, Opposing

See Opposing Wind.

2.791 Wind Rose

A diagram used on a pilot chart or weather chart to indicate clearly and concisely the average direction and force of the wind. The arrows which accompany each rose fly the wind and indicate by their length and thickness the frequency and force, also the direction of the wind.

2.792 Wind Set up

- a) The vertical rise in the still water level on the leeward side of a body of water caused by wind stresses on the surface of the water.
- b) The difference in still water levels on the windward and leeward sides of a body of water caused by wind stresses on the surface of the water.
- c) Synonymous with wind tide and storm surges. Storm surge is usually reserved for use for ocean and large bodies of water. Wind set up is usually reserved for use of reservoirs and smaller bodies of water.

2.793 Wind Tide

See Wind Set up, Storm Surge.

2.794 Wind Waves

- a) Waves being formed and built up by the wind.
- b) Loosely, any wave generated by wind.

2.795 Zone Tidal

The reach of a river or waterway where tidal phenomena are observed.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Ports, Harbours and Offshore Installations Sectional Committee, CED 47

<i>Organization</i>	<i>Representative(s)</i>
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